

# DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

EDITED BY EDWARD LIVING, B.A.

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Vol. II, No. 23. NOVEMBER 1921

(Annual Subscription 12s. 6d. Post Free)

PRICE 1s. NET



MERIDIAN STREET AT TIMGAD

*[By the courtesy of the Clarendon Press, Oxford]*

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JOHN MURRAY, 50A ALBEMARLE STREET, LONDON, W.1.

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**DISCOVERY.** A Monthly Popular Journal of Knowledge.

Edited by EDWARD LIVEING, B.A., Rothersthorpe, Northampton, to whom all Editorial Communications should be addressed. (Dr. A. S. Russell continues to act as Scientific Adviser.)

Published by JOHN MURRAY, 50A Albemarle Street, London, W.1, to whom all Business Communications should be addressed.

Advertisement Office: 16 Regent Street, London, S.W.1.

Annual Subscription, 12s. 6d. post free; single numbers, 1s. net; postage, 2d.

Binding cases for Vol. I, 1920, are now ready. Price 2s. 6d. net each; postage 7½d.

## Editorial Notes

NOT many weeks ago we witnessed a strange phenomenon in British mentality and psychology. During the meetings of the British Association, in which momentous discoveries in every branch of natural and applied science were being revealed and discussed by our most eminent scientists, a well-known film "star" arrived in England. We need not dwell on the many details of his popular triumph at the hands of both public and Press, to show how great and spontaneous it was—far greater and more spontaneous, for instance, than the interest accorded to the members or the discussions of the British Association. Now it serves no purpose to wail over such a phenomenon as though it were a proof of national decadence. We need to look at the facts clearly and calmly. The facts are that Charlie Chaplin is in his own sphere a genius; that the average man and woman need something not too serious to enliven their leisure hours, and that one of the easiest channels to such enlivenment lies through the moving picture; that cinemas have spread to the smallest town and to the remotest corners of the world, and are therefore able to bestow a world-wide fame on cinema "stars" such as no scientist, philosopher, or writer can expect to attain to till long after he is dead.

But these are only some of the facts, and, making all

allowances for their importance, we feel that they do not explain the phenomenon to our satisfaction. For the phenomenon grows out of some deeper tendency, such as has recently produced the strange eclipse of interest in any other current topic by the attention paid to the Carpentier-Dempsey boxing-match, such as every day turns the gaze of the average man to the "sports" page rather than to the more serious news in his daily paper, such as would, in the event of their death on the same day, induce our Press to publish far longer biographies of Charlie Chaplin than, say, of so distinguished a scientist as Sir Edward Thorpe. If we had space we could put forward a hundred and one reasons for these phenomena, but we believe that the chief reason lies in the peculiar social evolution of our times.

\* \* \* \* \*

It is easy enough to look back to past centuries and sigh for the active pursuit of knowledge that characterised the reigns, say, of Elizabeth or Victoria. But that pursuit was confined to a small, leisured class living, in the days of Elizabeth, amongst a multitude of semi-barbarians, and, in the days of Victoria, amongst a population that was only beginning to learn the rudiments of reading and writing. As we pointed out in our editorial notes several months ago, "the spirit of our own age is affecting all grades of our social complex." So far as the public to whom intellectual workers are to appeal is concerned, democracy produces a process of levelling up *and* levelling down the collective intelligence of a nation; a wider but more mediocre public. Now comes the question, "How is a powerful, living contact to be made and maintained between such a public and the advanced intellectual workers?" This question *must* be met in some practical attempt, for otherwise democracy will not promote, but obstruct progress; more than that, in the long run, without the stimulus that the sciences and arts supply to the social condition of the community, it will not produce a utopia, but a break-down in civilisation.

\* \* \* \* \*

There is no doubt that our men of science are to-day more than ever cognisant of this danger. Such a

realisation lent a common tone to all the speeches at this year's meeting of the British Association. Particularly remarkable from this point of view was Sir Richard Gregory's address<sup>1</sup> to the delegates of corresponding societies, urging them to make the importance of science, as well as its material assistance, felt in every corner of the country. Amongst many other fine and apposite statements, Sir Richard said: "In mechanics work is not considered to be done until the point of application of the force is moved; and knowledge, like energy, is of no practical value unless it is dynamic. The scientific society which shuts itself up in a house where a favoured few can contemplate its intellectual riches is no better than a group of misers in its relations to the community around it. The time has come for a crusade which will plant the flag of scientific truth in a bold position in every province of the modern world. . . . It is not by discoveries alone, and the records of them in volumes rarely consulted, that science is advanced, but by the diffusion of knowledge and the direction of men's minds and actions through it. In these democratic days no one accepts, as a working social ideal, Aristotle's view of a small and highly cultivated aristocracy pursuing the arts and sciences in secluded groves and maintained by manual workers excluded from citizenship!"

\* \* \* \* \*

It is true that in the past the intellectual worker has not sufficiently exerted himself in order to grip the attention of the public; it is equally true that the public has not hitherto manifested interest in his work. In his Presidential Address<sup>2</sup> at this year's Annual General Meeting of the British Academy, Sir Frederick Kenyon particularly emphasised this apathy:

"The progress of knowledge," he said, "of education, of culture in the widest sense of the term, is hampered by the dead weight of indifference with which it has to contend. Taking the British public as a whole, there is a solid mass of disbelief in the value of knowledge and of the things of the mind. In spite of the large class of amateurs of culture that the country possesses, people who sympathise with things of beauty and learning without pretending to be professional students of them, the nation has no deep-rooted faith in the necessity for such things. We are predominantly a materially minded people. Consequently literature, art, knowledge, wherever they have not an obvious material value, have to fight everywhere for recognition."

\* \* \* \* \*

So the fault is on both sides, or, rather, it is a fault resulting from the peculiar social conditions of our times.

<sup>1</sup> *The Advancement of Science*, 1921 (John Murray, 6s.), contains all the Presidential Addresses at this year's meeting.

<sup>2</sup> *The Fellowship of Learning*. By Sir F. G. Kenyon, K.C.B. (Published for the British Academy by Humphrey Milford, Oxford University Press, 1s. 6d.)

We shall not overcome it merely by education. An urge to a greater collective seriousness and care of thought must be started. The gulf of indifference must be bridged from both sides. On the one hand the intellectual workers will have to ford right out into the currents of daily life. Scientists have already done splendid service in this way, but, as Sir Frederick Kenyon pointed out later in his speech, they need to show a common front to the world; to show that their many branches of work link up one with the other; they need to show that the work of both natural and applied science is the backbone of nearly every commercial undertaking and every convenience of modern civilised life; that natural science, even when it has no immediate or apparent practical value, as, for instance, in Astronomy or Anthropology, opens up vistas of knowledge about ourselves and the universe in which we dwell, and makes us more sentient, more god-like beings. And our creative artists and scholars must continually be emphasising the fact that literature, art, and music are not composed just to worry schoolboys, to fill up the shelves of libraries, and to provide serious entertainments in the concert-hall or picture-gallery, but that they are forged from the very experiences and emotions of life, and react with incalculable effect on international, national, and individual destinies. Popular expositions of all branches of knowledge by the experts themselves, local scientific and artistic societies, the opportunities offered by institutions like the Workers' Education Association and the Co-operative Education Union, clubs for all classes and of all types in which our pioneers of thought can reveal and discuss their discoveries with members in a friendly spirit, cheaper books, the right kind of co-operation by the Press—all these things are needed more than ever to-day.

\* \* \* \* \*

And the public itself must meet the intellectual workers half-way and extend their sympathies to such movements. Politicians and business men can give them far more material support than they have hitherto done; our *leisured* and so-called *educated* classes must abandon their phlegmatic, half-contemptuous attitude to "learning"; the manual worker must be willing to realise that mental work is in its own way just as arduous and productive of results as his own work, and that the mental worker is a friend, not a foe. In Britain we are still apt to look askance at "stinks" men, "wild" poets, "book-worms," and "effeminate" musicians, and to forget that without them we should not have been blessed with electric light, telephones, railways, theatres, cinemas, and novels. But these are only some of their more concrete and visible contributions to life. In promoting knowledge the sciences and fine arts are at once the inspirers and measurers



of mankind's progress. A civilisation, for instance, affects the later history of the world not nearly so much by its imperial power as by the progress that it makes in thought and mental ideals. The poetry of a David or a Dante; the teaching of Buddha or Socrates or Plato or Paul—to appeal to no other names—have been a much greater influence in the world than the generalship of Alexander the Great or Napoleon Buonaparte.

\* \* \* \* \*

In conclusion, we emphasise the immediate need of spreading knowledge and culture and the desire for them throughout this country and this Empire. Behind all voluntary action, individual or concerted, lies thought; so much uninstructed thinking on every problem, social, political, scientific, is apparent nowadays, that the need for true knowledge and for the habit of seeking it humbly and patiently is imperative; without true knowledge there is wrong thought; with wrong thought there will be wrong action, and in national and international affairs, which are steadily becoming more complicated, disaster and chaos will most certainly ensue. True knowledge makes us understand ourselves and others; it will lend us sympathy and give durability and foresight to our individual, our social, and our political life. Four years after the Battle of Waterloo, when Europe was in much the same position as she is to-day, struggling to free herself from the aftermath of protracted wars, a great poet saw this need, and completed one of his lyrical plays<sup>1</sup> with these lines:

"Gentleness, Virtue, Wisdom, and Endurance,  
These are the seals of that most firm assurance  
Which bars the pit over Destruction's strength;  
And if, with infirm hand, Eternity,  
Mother of many acts and hours, should free  
The serpent that would clasp her with his length;  
These are the spells by which to reassume  
An empire o'er the disentangled gloom.  
To suffer woes which Hope thinks infinite,  
To forgive wrongs darker than death or night;  
To defy Power, which seems omnipotent;  
To love, and bear; to hope till Hope creates  
From its own wreck the thing it contemplates;  
Neither to change, nor falter, nor repent;  
This, like thy glory, Titan, is to be  
Good, great and joyous, beautiful and free;  
This is alone Life, Joy, Empire, and Victory."

THE October number of *The Geographical Journal* contains, amongst other interesting features, some remarkable photographs of Mount Everest and its surroundings, taken by Lieut.-Col. Howard Bury, D.S.O., Chief of the Mount Everest Expedition. The *Bulletin* of the League of Red Cross Societies (published every two months at Geneva in English, French, Italian, and Spanish) is a sign of the developments that are occurring in international co-operation in the world of surgery and medicine. Amongst other articles in the July-August issue are descriptions of the famine in China, new aeroplane ambulances, and new methods of combating tuberculosis.

<sup>1</sup> Shelley, *Prometheus Unbound*.

## Dante's Lyrical Poems

By Edmund G. Gardner, Litt.D.

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ITALY has just celebrated the sixth centenary of the death of Dante, not only by solemn functions at Ravenna, Florence, and Rome, but also—in a more permanent fashion—by the publication, under the auspices of the Società Dantesca Italiana, of the first critical edition of the text of his complete works. A most noteworthy feature in this volume is the presentation of the *Rime* by Professor Michele Barbi, whose researches—which have occupied him for many years—have resulted, for the first time, in a clear discrimination between authentic, doubtful, and spurious compositions, and in a text which (if not in all respects absolutely decisive, for that, given the manuscript conditions under which they have come down to us, would have been an impossible achievement) is an immeasurable advance upon anything which we have hitherto possessed.

The *Rime*—sometimes, less accurately, known as the *Canzoniere*—is a collective title for Dante's lyrics, more particularly those which he did not insert in the *Vita Nuova* or which were written later. They include canzoni, ballate, and sonnets. Italians, of course, regard the last-named as a lyrical measure, and John Addington Symonds, it will perhaps be remembered, aptly described a sonnet as "essentially a meditative lyric." English readers probably made their first acquaintance with some of these poems in the selection translated by Rossetti in *Dante and his Circle*. Rossetti chose 3 canzoni (the sestina is only a special form of canzone), 1 ballata, and 11 sonnets. But those were uncritical days. Two of the canzoni, "Love, since it is thy will that I return" and "Death, since I find not one with whom to grieve," the ballata, "Because mine eyes can never have their fill," and two of the sonnets, "My curse be on the day when first I saw" and "The King by whose rich grace His servants be," are now known, beyond the shadow of a doubt, to be the work of other poets than Dante. Later, the standard of reference for the *Rime*, or *Canzoniere*, has been the section devoted to them in the *Oxford Dante*, based originally on Fraticelli, but unsatisfactory as to the text, including many spurious and excluding not a few unquestionably authentic poems. For English readers, the little volume edited by Dr. Wicksteed and Professor Okey in the *Temple Classics* marked a distinct advance in all these respects, but made no claim to be anything more than provisional. Professor Barbi's work now represents the fulfilment of one of the most urgent needs of all students of Dante.

Apart from the *Vita Nuova* and the three canzoni included in the *Convivio* (the unfinished work in which he intended to comment upon 14 of these poems), the critical edition accepts as genuine poems of Dante 13 canzoni, 5 ballate, 34 sonnets, and 2 stanze. It is pleasant to observe that two sonnets, translated by Rossetti, but unhesitatingly rejected by recent editors, are now given a place in the canon. These are the charming "Master Brunetto, this my little maid," which, however, has no connection (as Rossetti supposed) with Brunetto Latini or the *Vita Nuova*, and "Upon a day came sorrow into me," which Rossetti took as referring to the death of Beatrice. I must confess personally to being not quite convinced as to the sufficiency of the evidence for the unqualified acceptance of some of the poems received into the canon; but this is immaterial.

The *Rime* bring to perfection the technique of early Italian lyrical poetry, itself in part a heritage of the poets of the Sicilian school from the troubadours of Provence, and the spiritual ideals of the "sweet new style," of which the initial inspiration came from Guido Guinicelli at Bologna. They gradually prepare the way for the ampler music of the *Divina Commedia*.

Dante no doubt included what he regarded as the best of his lyrics for Beatrice in the *Vita Nuova*; but we find among his "juvenilia" such little masterpieces as the sonnet to Guido Cavalcanti, *Guido, i vorrei che tu e Lapo ed io*, with its romantic atmosphere and Merlin's enchanted boat, and that other, *Suonar braccetti e cacciatori aizzare*, in which the poet of love appears incongruously at a hunting party and appreciates a kindly jape at his own expense:—

"Guido, I would that thou and Lapo and I were taken by enchantment and set in a boat, which under every wind should course the sea at your will and mine; so that no tempest or other evil weather could hinder us, but rather, living always in one desire, our wish to abide together might increase. And Lady Vanna and Lady Lagia too, with her who is thirtieth on the roll, should the good magician place with us; and there to discourse always on love; and each of them to be content, as I am sure that we should be.

"Beagles questing and huntsmen setting on, hares starting and folk hallooing, and from the leash swift hounds issuing to scour fair slopes and seize the quarry! In sooth, I think it should delight a heart that is free and void of purpose; and I, among my amorous musings, am mocked by one on this account, who jests with me thus in familiar wise: 'Now see the chivalry of a noble heart; for a sport so rustic to leave ladies and their joyous semblance!' Then, fearing lest Love may hear, I am ashamed, and go downcast thereat."

In a lighter mood, too, are some of the pieces which appear for the first time in the present edition; the sonnet on the Garisenda tower of Bologna; various epistolary sonnets, in which no doubt at times, when answering friends or other contemporary rhymers, Dante wrote without any very serious intent or deliberation: "Rispondo brieve con poco pensare," as he says in one of the sonnets now added to the list. In the abusive tenzone with Forese Donati (which should not, perhaps, be taken too seriously), Dante is following the practice, which Rustico di Filippo had made characteristically Florentine (though Guido Guinicelli himself once did the like), of employing the sonnet for satire and burlesque. Most of the sonnets interchanged with Cino da Pistoia belong to a later date, and—with one exception—are in a strain of high solemnity.

The most striking lyrics composed by Dante during the years between the completion of the *Vita Nuova* and his exile are the "rime pietrose" and certain allegorical poems expressing a novel conception of love. The former—four canzoni—are remarkable for a peculiar and incessant playing upon the word *pietra*, "stone," which led to the theory that they were inspired by a lady named Pietra, or, at least ("Pietra," like other names of this kind introduced into Dante's lyrics, being probably a device like that used by the Provençals), by one who had proved hard and rigid where Beatrice had been the giver of blessing. One of the group strikes a note of stormy, even sensual passion that we hardly meet elsewhere in Dante's lyrics. In another, "To the show day and the great circle of shadow" (familiar to English readers in Rossetti), we have the first example in Italian of what was later called a sestina—the peculiar form of canzone invented by the troubadour, Arnaut Daniel, for the expression of the mood of a mind haunted by fixed ideas round which it plays in a poetical attempt to discover their ultimate relations with itself and with each other. But the unquestionable masterpiece in this group is the canzone, "I am come to the point of the wheel," on love in winter, contrasting stanza by stanza the phenomena of the external world in the season of ice and snow with the state of the poet's soul, ever burning in the "sweet torment" of love's fires. It is the artistic perfecting of a species of poem not unfrequent with the troubadours of Provence.

The allegorical canzoni express a love that is identical with philosophical devotion. Dante writes in the *Convivio* (ii. 16): "By love, in this allegory, is always intended that study which is the application of the enamoured mind to that thing of which it is enamoured." They illustrate the fundamental idea of the *Convivio* that philosophy is the amorous use of wisdom, or, as Hugh of St. Victor put it, "the love and the study and, in a certain manner, the friendship of

wisdom." The student's impassioned quest of philosophical truth, with its alternations of success and failure, is translated into the language of the earthly lover in his pursuit of a mortal mistress, and philosophy herself becomes an idealised human personality whose body is wisdom and whose soul is love. The supreme, triumphant expression of this suprasensible intellectual passion is found in the second canzone of the *Convivio*: "Love that in my mind discourses to me." (where the presentation of the lady of the poet's mystical creed is modelled upon the Beatrice of the *Vita Nuova*); the record of some hour in the student's labour when the clouds suddenly lift, height above height is revealed, and the path seems clear and easy to the aerial battlements of some spiritual fortress that before seemed inaccessible. I believe that the canzoni, "Love that movest thy power from heaven," and "I so feel the great might of love," together with several minor lyrics which Professor Barbi similarly classes as "rime d'amore," should be placed in the same series. A pendant to this group is given by the two didactic canzoni, in which Dante, when inspiration flags, turns from singing of philosophical love to some humbler ethical theme, "for the good of the world that liveth ill"; the canzoni on *gentilezza*, true nobility, and *leggiadria*, the outward manifestation of a chivalrous soul in man and its counterpart in woman.

Dante wrote few lyrics in exile, but two are among his greatest. The canzone, "Three ladies have come around my heart" (which fascinated Coleridge), has been called his poetical "apologia pro vita sua." From the legend of the apparition of Lady Poverty and her two companions to St. Francis, and the fifty-first chapter of Isaiah, it weaves an allegorical representation of how the call came to Dante to stand forth as the proclaimer of justice, *vir praedicans iustitiam*. It is here that the poet declares that he holds his exile as an honour, and first utters the prophetic note which is to sound again in sterner accents in the *Divina Commedia*. Almost as powerful and impressive, though of less purely poetical value, is the canzone, "Grief brings courage to my heart," upon which, in the *De Vulgari Eloquentia*, Dante bases his claim to rank as the poet of "rectitudo." In its scathing satire of vice, its realism and psychological insight, this canzone, too, prepares us for the *Divina Commedia*; but it is on a lower spiritual plane than its predecessor. There is evidence that Dante intended to comment upon these two poems in the fourteenth and fifteenth treatises of the *Convivio*, if that work had been completed. It is strange enough, after these poems, to find Dante singing once more of earthly love, in a canzone of which the true significance in his inner life remains

<sup>1</sup> A close comparison with the first canzone of the *Vita Nuova*, *Donne ch'avete intelletto d'amore*, makes this quite clear.

an impenetrable mystery. That I cannot follow Professor Barbi in closing the *Rime* with a love sonnet: *Per quella via che la bellezza corre*; "Along that way which beauty runs when she goes to waken love in the mind"; for this seems to me to belong unquestionably to a date before Dante's exile. Rather should I take as the epilogue to his lyrical work one of the sonnets to Cino da Pistoia:

"Io mi credea del tutto esser partito  
da queste nostre rime, messer Cino,  
chè si conviene omai altro cammino  
a la mia nave più lungi dal lito."

"I deemed myself utterly departed from these rhymes of ours, Messer Cino, for henceforth another track befits my ship more distant from the shore." Dante's lyrical work was now a thing of the past, for the ship of his genius had put forth upon the boundless waters of the *Divina Commedia*.

#### BIBLIOGRAPHICAL NOTE

*Le opere di Dante, testo critico della Società Dantesca Italiana* (Florence, Bemporad, 36 lire, 1921); *Tutte le opere di Dante Alighieri* (The Oxford Dante, 3rd edition, Oxford, 1904); *The Vita Nuova and Canzoniere of Dante*, edited by Okey and Wicksteed (Temple Classics, Dent, London, 1906); Benedetto Croce, *La poesia di Dante* (Bari, Laterza, 1921), cap. i. The following pieces in the Oxford Dante are spurious: Sest. III, Sest. IV, Canz. XVII, Canz. XVIII; Sonnets XXVIII, XXXI, XXXIII, XXXV, XXXVII, XLII, XLV, XLVIII, L; Ballate IV and IX. The following are regarded by Prof. Barbi as doubtful: Canz. XXI, Son. XXXVIII, Son. XXXIX, Son. XLVII, Ball. III, Ball. V (Ball. VII is not a ballata, but a stanza). Among the poems classed as "certainly genuine" in the Temple Classics, only Son. V is rejected by Prof. Barbi. Of the "probably authentic," Son. XIV is genuine, Son. XV spurious, Son. XVI doubtful, Ball. V doubtful. Of the "probably spurious," Son. XVII and Son. XVIII are rightly so described, Son. XIX, XX, XXI (according to Prof. Barbi) authentic, Ball. VI doubtful. The new edition includes many lyrics which are not contained in the *Oxford Dante*, the *Temple Classics*, or any other previous edition.

## The Electric Arc in Chemical Industry

By J. N. Pring, M.B.E., D.Sc.

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THE most obvious uses to which electricity has been put in the last fifty years, a time which the future historian will no doubt label as the electrical age, have been in the realm of telegraphy, locomotion, artificial light, X-rays, and the transmission of power. But one development, although more in the background,



is not less fundamental in importance—the application of electricity to the crucible of the chemist. By this alliance with chemistry Galvani, Volta, and others first achieved systematically the production of electricity, and Davy, in breaking up chemical compounds into their constituent elements by means of an electric current, demonstrated the molecular structure of matter. From this early time in the nineteenth century onwards, as improved methods of producing an electric current in increasing magnitudes were discovered, one of the first experiments to be tried with the new power was its effect on chemical change. In all instances experiments were first done in a laboratory, scientifically and on a small scale, but the industrial application of electricity was always kept in view, and the course of research was largely guided by industrial needs.

It is noteworthy that a very large share both of the pioneering work in industrial electro-chemistry, and of purely scientific discoveries which are the basis of these processes, was done by workers of this country. The lead, however, in the development of these industries has, in nearly every instance, been left to other countries, where large-scale industrial enterprises are not characterised by the same degree of inertia as at home. Nevertheless, the development in this country has been very rapid. As recently as 1887, a noteworthy landmark was created in the construction, for the electrical production of aluminium alloys in Staffordshire, of an electric generator working the then record production of 500 horse-power. To-day, the installation of turbo-generators of 50,000 horse-power passes without public notice, and it is hardly a matter for comment that at least one electric supply company in this country distributes coal-generated power approaching in magnitude the total developed capacity of the Niagara Falls.

In one respect our country appears to be at an obvious disadvantage, namely, in the scarcity of waterfalls which can be harnessed for the production of power. For this we have largely to use coal, and as coal is dearer than water, the utilisation of large water powers such as exist in Scandinavia and America seems to offer a marked advantage economically over steam-power stations. But, fortunately for this country, present-day tendencies have already reversed this position. For the most favourable water-powers in accessible parts of the world have already been harnessed, and further developments can only be made at greater cost and in places farther afield, while, in the case of steam power, continual progress in power-development is being made, with a consequent increase in economy. The operation of this factor is, indeed, now leading to a redistribution of electro-chemical industries from large water-power centres

like Norway and Niagara, to districts near the coal-fields where, incidentally, there are available also the very large supplies of water needed for cooling modern condensers.

Apart from the commercial bearing of this subject, there are several directions in which electro-chemistry is of vital and national interest. The present discussion of this subject will be limited to two of the more outstanding of these developments:

(1) The manufacture from the atmosphere of nitrogen compounds which form the basis of fertilisers and explosives. In this electrical synthesis, the starting-point or raw materials used consist solely of the earth's atmosphere and water, together, in some cases, with lime.

(2) The preparation of alloy-steels of extreme hardness and tensile properties. These products are utilised in the manufacture of high-speed cutting steels, and for the construction of the armour plate of battleships. It is largely to the special properties of this metal that we owe our margin of superiority in naval armaments.

## I

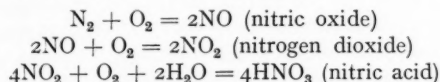
The fixation of atmospheric nitrogen is based on the scientific discovery of Cavendish, as early as 1784, that nitrogen can be made to combine with oxygen, by exposing both gases to an electric discharge. This reaction was investigated later more completely by Lord Rayleigh in 1897, and the industrial manufacture of nitric acid by this means was first undertaken by McDougal and Howles at Manchester in 1900.

The stimulus which has, in recent years, been given to this enterprise was created by the realisation that the world's supplies of nitrates, which have resided hitherto mainly in the saltpetre beds of Chile, are within a measurable distance of exhaustion. Moreover, the experience of the recent war has emphasised the disadvantages of fetching from so great a distance the material which forms the primary requirement of agriculture and of all explosives. There is, however, a source nearer home. The air over a single square mile of the earth's surface is estimated to contain about 20,000,000 tons of nitrogen, which is approximately equivalent to thirty times the quantity of *combined* nitrogen contained in the world's production for the year 1913 of Chile nitrate and ammonium sulphate, an alternative source. The conversion of this into the nitrogen compounds so sorely needed in the arts of peace is therefore a most important chemical and engineering problem.

One of the main processes for accomplishing the artificial production of nitrates consists in subjecting air to an electrical discharge or so-called high-tension arc. By this means, the nitrogen and oxygen are



induced to combine, giving a compound which in contact with more air reacts with water to give nitric acid. The processes may be represented approximately by the following formulæ :



The addition of lime and ammonia then give respectively calcium nitrate, which can be applied as a fertiliser, and ammonium nitrate, which forms the basis of explosives.

The electric arcs used in chemical processes are of two distinct types, the high-tension arc and the low-tension. The former is identical with a miniature lightning discharge continuously maintained, and is produced by a small quantity or volume of electricity at a very high potential or pressure, while the latter is obtained by the passage of a large current at a low potential between two adjacent poles or electrodes which are thus raised to their volatilisation temperature and yield the vapour needed to conduct the current.

One of the main types of apparatus employed in Norway for effecting the union of nitrogen and oxygen is illustrated in Fig. 1. In the type shown, known as the Birkeland-Eyde process, a current of

air is drawn through a narrow drum-shaped enclosure in the centre of which a high-tension arc is formed between hollow copper tubes through which water circulates. By means of a magnetic force, which is applied on the outside of the arc, a discharge is caused to spread out in the form of a large fan and fill the space traversed by the air, which emerges with a large content of oxides of nitrogen. In the installation seen in Fig. 1, forty-five of these furnaces are in operation, and each furnace consumes electric energy to the amount of 4,000 horse-power.

In another type, designed by Schönherr, the air is passed, at a high velocity, up vertical towers, and the high-tension arc is adjusted to extend in rod form axially through the centre of each tube, for a distance of 25 feet. Each of these units consumes 1,300 horse-power of electric energy.

The oxides of nitrogen, in all processes, are conducted to a separate building, where they are passed up a series of towers 100 feet high, containing pieces of quartz down which water percolates. Nitric acid is thus formed, and later converted into nitrates as required.

The factories in Norway are situated at Rjukan, a somewhat isolated district possessing abundant water power which furnishes all the energy required. One

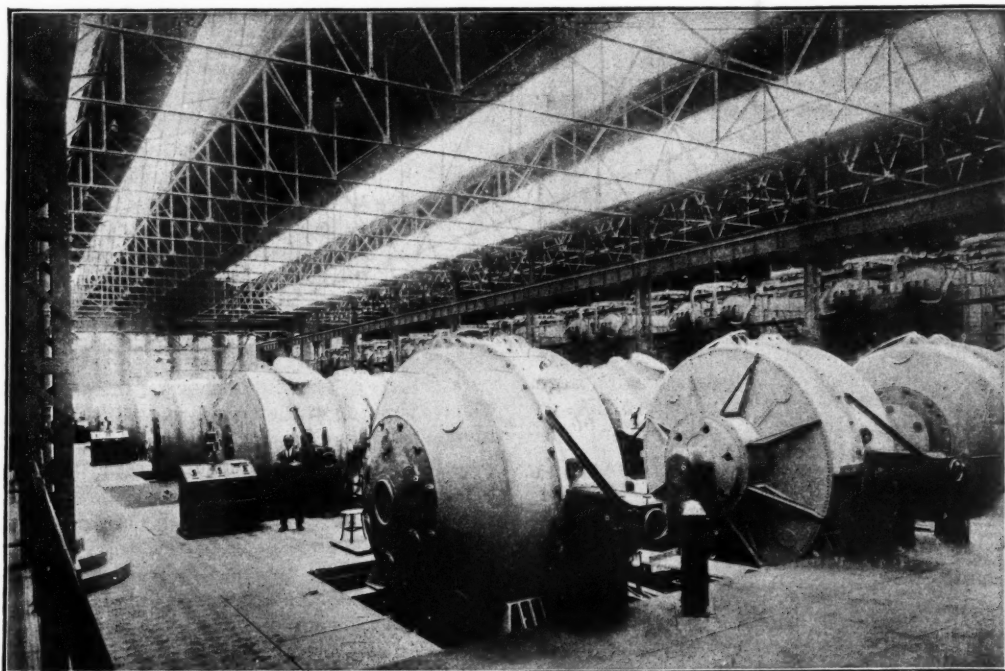


FIG. 1.—BIRKELAND-EYDE FURNACES AT SAAHEIM, SWEDEN.  
(The Norwegian Hydro-Electric Nitrogen Company.)  
(By kind permission of Messrs. Longmans, Green & Co.)



FIG. 2.—THE POWER STATION AT VERMORK, SWEDEN.  
(By kind permission of Messrs. Longmans, Green & Co.)

of these power-developments is illustrated in Fig. 2. The supply of water is there derived from Lake Mös-vand, 3,000 feet above sea-level. From there the water is led for about three miles through a tunnel in the rock, to a distributing basin or reservoir excavated from the rock, and thence, as illustrated in Fig. 2, down ten steel pipes 4 to 7 feet wide through a fall in level of 940 feet, to the turbines at the base. Each turbine generates 14,500 horse-power, so that altogether 145,000 horse-power is generated. After issuing from this power station, the water is again utilised through being led, in a similar manner, to a second station about 1,000 feet lower down, where a further 162,000 horse-power is developed. Still further possibilities in power generation at the first site are revealed in the surplus water seen in the photograph, which at present serves only for display.

It is of interest to note that in the development of these factories in Norway, the co-operation of Germany was extended to the Norwegian Company, through the agency of the *Badische Anilin und Soda Fabrik*<sup>1</sup> and other allied organisations. Before the war, however, the German interest was withdrawn and, with some foresight, the process was installed in Germany. However, the output of the Norwegian factories, which, after 1916, exceeded 50,000 tons of ammonium

<sup>1</sup> Where the big explosion on the Rhine recently took place.

nitrate annually, formed a material contribution to this country's supplies of explosives.

## II

The experimental manufacture of steel in an electric furnace falls to the credit of this country through the work of William von Siemens, in 1878, and Ferranti, who developed the first type of induction furnace in 1887. Electric furnaces, which are now widely used for the production of steel of all classes, and which have already largely supplanted the "crucible" process, are generally operated by the principle of the low-tension arc. An example of this form of arc is seen in everyday life in the flashes which appear from the trolley poles of cars, and from the rails at places where the surface is uneven or coated with foreign insulating matter. An electric discharge is thus produced which, through its excessive temperature, leads to a volatilisation of some of the metal, thus giving the appearance of a luminous flame. The principle generally applied in electric furnace operation is that of causing an arc to play between a large block or electrode of carbon (or a series of such electrodes) and the surface of metal or material in the crucible to be treated. In this way, temperatures can be reached which are well beyond the zone of those given by any form of fuel-heating. The temperature

is, in fact, only limited by the boiling-point of carbon or other materials in the path of the arc, and may be as high as 7,000° Fahr. A second advantage is that the conditions can be adjusted to give temperatures of any lower degree as desired, while the use of electricity enables a careful and convenient adjustment of the heating to be made.

Fig. 3 illustrates a bath of steel during the pouring operation. This metal has been prepared by submitting a charge of cast iron with certain alloys and fluxes for a few hours to the high temperature of electric arcs formed between the three superposed carbon electrodes and the surface of the slag.

The main incentives to the development of electric furnaces in the iron and steel industry have been the exacting requirements of the present-day engineer. The demand for high-grade material which, on a large scale, can only be met satisfactorily by electro-metallurgical methods, is particularly in evidence in the case of metals for cars and aircraft machinery, and particularly in America, for the steel rails necessary to meet the increasing weight and speed of rolling stock. Apart from a field of its own which electricity has established in the above instances, the application of electrical heating methods is gradually extending over the whole field of chemical and metallurgical technology. For instance, in certain countries, the electric furnace has entered into successful rivalry with, and proved its overall superiority to, the modern blast furnace for producing cast iron, which in its present-day efficiency and economy is generally put forward as the model of fuel-heating processes. The electric smelting of iron ores has become mainly established at several centres in Sweden where cheap water power is available. A typical plant in use for this purpose is a modified blast furnace of the ordinary type. The charge is admitted down a tall shaft to the melting chamber at the base, where it is submitted to the heating action of arcs from a number of electrodes spaced equidistantly and traversing the roof of the chamber. The electrodes are of moulded carbon, 2 feet in diameter and 4 to 5 feet long. The gases produced from the reaction, which when burned give out great heat, are led through the column of descending charge and cause a partial reduction and preheating of the ore. The hot gases are withdrawn from the top, and a portion of them is again admitted at the base and thus continuously circulated, while the remainder is utilised in heating steel furnaces and for

generating power. These furnaces are now constructed in larger sizes; units to the number of about twenty, each consuming 10,000 horse-power, are now in operation in Sweden.

The electric smelting of iron ores can best compete with the older-established and highly-efficient blast furnace in districts where suitable ore and cheap power is available, but where fuel is scarce. Some form of carbon is, of course, necessary for the reduction of the ore even in the electrical process, but a smaller amount is used in the electrical heating than where, in the form of coke, it is used also to produce heat in the blast furnace. Apart from the question of the relative economies of coke and electrical energy, a further consideration is the improved quality of iron made electrically. This is due to the reduction of contamination of the iron by the impurities contained in the coke. The usual Swedish practice is to utilise charcoal as the form of carbon, and thus produce material of the special qualities of the well-known Swedish charcoal-iron. This product was

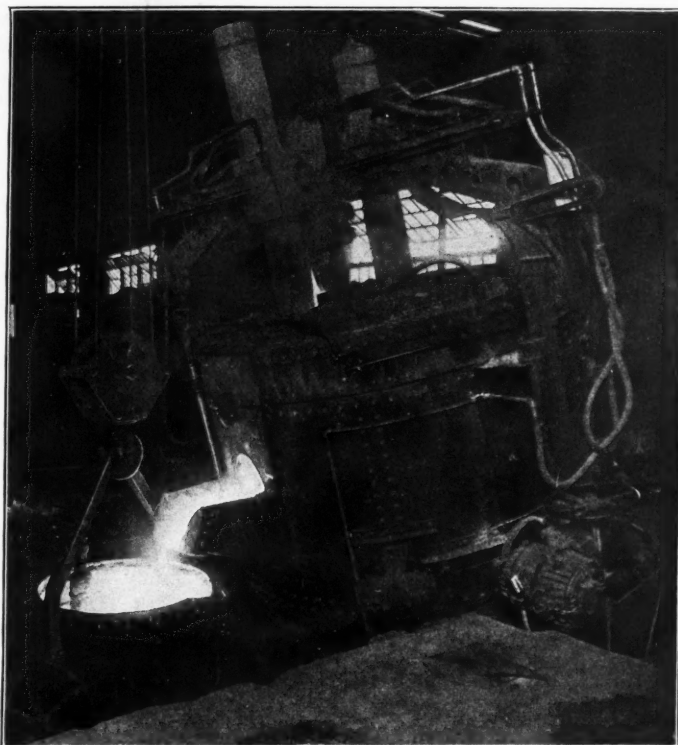


FIG. 3.—BOOTH HALL, ELECTRIC FURNACE.  
(By kind permission of Messrs. Longmans, Green & Co.)

formerly produced in charcoal-heated blast furnaces, and the saving of charcoal effected by the electrical procedure represents the main factor in its economy.



In considering the position of electro-chemical enterprises generally, we shall find that the main obstacle offered to their development in the nineteenth century was the necessity of generating specially the large amount of electrical power required. At the present time the most economical way of obtaining electrical energy is to have it generated in large centralised generating stations situated near the coalfields and distributing the power electrically. Such stations are developing rapidly, because they offer the most economical method of power generation. For these undertakings, of course, coal is a necessity. A very considerable economy is effected by them, partly because of the large scale of operation, and partly because the distribution of power over large areas for miscellaneous services such as factories, railways, and lighting, leads to a more favourable balancing or averaging of the consumption, known as the load factor.

The future interests of this country can be regarded with equanimity, despite the prospect of the exhaustion of our coalfields some day. That day is still far off and, by the time it comes, engineers may have harnessed tidal energy, a source of power now under serious consideration. There is, further, a more remote possibility of the employment of the internal heat of the earth. As with present large power stations, it may be assumed that power from these sources, when it is generated, will be distributed electrically, and thus complete the inception of the electric furnace in chemical industry.

## The Problem of Unemployment

By Douglas Knoop, M.A.

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UNEMPLOYMENT is not a new discovery; it is a social ill which has existed in this country since at any rate the sixteenth century.<sup>1</sup> It appears to be of the nature of a disease, like influenza, cases of which are present all the time, but which does not attract much attention in a community accustomed to it, until there is a sharp and widespread outbreak. There is always some unemployment in the community, but nobody ordinarily worries much about it; from time to time, however, it spreads widely and assumes

<sup>1</sup> See Leonard, *Early English Poor Relief*, for details of the problem of unemployment in the sixteenth and seventeenth centuries.

alarming proportions. Public interest is then aroused, the evils of unemployment are recognised, and efforts are made to combat the outbreak. The community is suffering from a particularly bad outbreak of unemployment at the present time, and it will be worth our while briefly to examine the problem.

### I

It has long been recognised that the state of employment is subject to periodic changes, that a boom in trade is followed by a slump in trade, that the slump in its turn is succeeded by another boom, and so forth. It is not my intention in this short article to discuss the characteristics and causes of ups and downs in trade. Here we shall accept the fact that we are suffering from a bad slump in trade and consequent unemployment, and we shall consider the special conditions which appear to be associated with the present slump. Every depression in trade has a certain individuality of its own, which differentiates it from other depressions, but usually the special conditions connected with a slump are comparatively unimportant compared with the general conditions common to all slumps. In the present case, the special conditions appear to be unpleasantly numerous.

In order to study the special conditions associated with the present slump, it is desirable to classify them. In the first place, we may separate (1) what we may call the special features of the present outbreak of unemployment from (2) the special influences which are accentuating the outbreak. In the second place, we can divide the special influences into three classes: (i) those arising from the character of the post-war boom in trade; (ii) those which are an aftermath of the war; and (iii) other special influences.

i. The special features of the present outbreak of unemployment appear to be its suddenness and its acuteness. Its suddenness arises from the character of the post-war boom and is referred to below. In what concerns the acuteness, three things seem to have accentuated it in appearance, if not in reality:

(a) Unemployment during the last year or two of the war was abnormally low, it was almost non-existent. Whereas during ordinary booms in trade the average number of unemployed trade unionists has rarely fallen below 20 or 25 per 1,000, the number was as low as 4 per 1,000 in 1916, 7 per 1,000 in 1917, and 8 per 1,000 in 1918; even during the summer of 1920 it was below 20 per 1,000. The present figure of 165 per 1,000 is contrasted in people's minds, not with a figure of 20 or 25 per 1,000, a sufficiently striking difference, but with a figure of 7 or 8 per 1,000, a perfectly staggering contrast. Instead of unemployment being about eight times as bad as during an ordinary spell of good trade, it is approximately twenty times as bad as



during the abnormal trade conditions of two or three years ago.

(b) The interval which has elapsed since the last spell of severe unemployment has been unusually long. The last years of depression were 1908 and 1909. If it is admitted that juvenile workers are not seriously affected by unemployment, it follows that no one who was under 18 in 1909, or under 30 to-day, has had practical experience of a serious spell of unemployment before the present outbreak. Every outbreak of unemployment is an unpleasant novel experience to a group of young workers; in 1908 the group was very small, as the last previous year of bad trade was 1905. In 1908 a serious liability to unemployment was a new experience only for youths and girls of 18, 19, and 20. At the present moment the group of novices, so far as unemployment is concerned, is some three or four times as large as the corresponding group in 1908, for it consists of all adult workers under 29 or 30 years of age. Furthermore, the length of the spell of good trade has caused the dread of unemployment to lose much of its poignancy even for older workers, so that the present severe outbreak must come as a most disagreeable experience to older as well as to younger workers.

(c) Whilst the general public, in judging of the present state of unemployment, is no doubt influenced by the contrast with the favourable employment conditions prevailing in recent years, and by the length of the interval since the last slump, it is probably also influenced by the new form in which unemployment statistics are published. With the wide extension of the unemployment insurance scheme, it has become possible to ascertain that  $x$  persons are unemployed in this country at a particular time, instead of merely learning that  $y$  per 1,000 trade unionists are unemployed. Most people are probably much more impressed by the statement that 1,603,369 persons were unemployed at the end of August, than by the statement that 16.5 per cent. of trade unionists were then out of work. The new statistics have a tendency to magnify in the minds of the public the extent of the present problem.

2. The special conditions which are influencing unfavourably the present slump in trade are to be attributed in a large measure to the war. Students of economic history are well acquainted with the fact that a war tends to be followed in the first instance by a boom in trade, and then by a bad slump. A post-war boom is itself an effect of war conditions, so that the influences exercised on the present slump by the preceding boom were caused indirectly by the war, and might not unreasonably be grouped with the war influences. We prefer, however, for the sake of clearness, to class them separately and to consider them first.

(i) (a) The post-war boom was a very feverish and speculative affair. The amount of goods changing hands was probably very modest compared with the amount changing hands in a good pre-war year like 1912 or 1913. The business community and the general public were very optimistic after the Armistice, and no considerable flow of new orders was necessary in order to place a tremendous strain upon industry engaged at the time in trying to change over from war output to peace output. In many trades producers were unable to place even a moderate supply of goods upon the market; the limitation of supplies, in conjunction with the increased demand, caused prices to soar rapidly to dizzy heights unknown in ordinary booms. Buyers, realising how difficult it was to secure delivery, frequently ordered two or three times as much as they wanted in the hopes of obtaining something like the amounts they really required. This practice also helped to drive up prices. Fortunes were being made, though mostly on paper; industrial extensions and developments of all kinds were planned; the public, its appetite whetted by the prospect of share bonuses and substantial dividends, was prepared to finance industry freely. People bought shares indiscriminately in fresh concerns, in reconstructed companies, in new amalgamations and in well-established old firms. The boom was much too fevered to last long; it was soon discovered that industrial expansion was on anything but a sound basis; the tide of trade turned, and as the flow had been both great and rapid, not unnaturally the ebb was also great and rapid. The sharp reaction in prices caused all firms holding stocks to be faced with heavy losses; business houses which had over-ordered during the boom now unexpectedly found their whole orders being executed at prices well in excess of current quotations; they had either to accept delivery and shoulder heavy losses, or cancel orders and attempt to throw the losses back on to the sellers. In either case, the effects were very depressing on business enterprise, and employment suffered accordingly.

(b) Owing to the post-war boom being so short, a considerable number of demobilised men never had a chance of being properly absorbed into industry. Consequently they very quickly found themselves out of work when the tide of trade turned.

(ii) (a) Though the least fundamental in character, the war influence which has perhaps had the most immediately depressing effect on industry has been the great sales of war stores. At first, owing to the scarcity of goods of all kinds and the inability of producers to meet the public demand, the sale of war stores acted as some check on the rise in prices without harming producers; but when the first rush of new business was over, the large supplies of goods remaining

on the hands of the Disposal Board, and of firms which had purchased war stores in bulk and not yet disposed of them, began to act as a wet blanket on business enterprise.

(b) The financial disorganisation caused by the war is having a very prejudicial effect upon trade and employment. This operates in two entirely different ways. (1) It has led to a marked rise in the rate of interest which seriously checks new enterprises requiring capital. A development which might be soundly financed, if money could be borrowed at  $3\frac{1}{2}$  or 4 per cent., may be outside the scope of practical politics if money has to be borrowed at 6 or  $6\frac{1}{2}$  per cent. (2) The foreign exchanges are badly out of joint. It is not merely that our producers are liable to be undersold by certain Continental countries, and that many foreigners cannot afford to buy our goods because sterling stands at such a high premium in terms of their currencies, but that, owing to the violent fluctuations in the foreign exchanges, a large speculative element has been introduced into all foreign trade, which tends to discourage our manufacturers from selling abroad.

(c) The high costs of production since the war are restricting sales; amongst the factors leading to high costs of production may be noted: (i) the enhanced rate of interest referred to above; (ii) the high prices of raw materials; (iii) high rates of wages, and this in its turn leads to high prices of raw materials, e.g. coal; and (iv) low daily rates of output. In many ways the last is the most serious of all. It is partly accounted for by reduced hours of labour, but the output per hour in many industries has fallen, whereas reduced hours should enable a higher hourly output to be secured. High wages themselves are not incompatible with low costs of production, but high wages in conjunction with slow working makes production very costly.

(d) The war has left most of the combatant countries seriously impoverished and exhausted, and with greatly reduced purchasing power. Quite apart from the problem of the foreign exchanges mentioned above, several of the Continental countries are obliged to devote practically their whole energies to feeding themselves and repairing the damages of war, and they consequently have no surplus products available to exchange with other countries. In view of the importance of foreign trade to this country, the temporary loss of several Continental markets is very prejudicial both directly and indirectly. It is not merely that Continental countries are buying less from us, but they are also buying less from various overseas countries, e.g. coffee from Brazil and cotton from India, a fact which diminishes the purchasing power of overseas countries in our markets.

(iii) (a) Much the most serious of the other special

influences which are accentuating the present outbreak of unemployment is the series of big strikes which have occurred since the Armistice, e.g. the moulders' strike, and, in particular, the recent coal dispute. Industrial disputes nearly always throw some workers out of employment, quite apart from those who are on strike, or who are locked out, and in the case of the coal dispute whole industries have been closed down for want of fuel. Restarting an industry after it has been closed down is never a very rapid process, but it is particularly slow when it occurs at a time of general trade depression.

(b) Certain industries, in particular the Lancashire cotton trade, are at present adversely affected by the Indian trade boycott.

## II

Even a brief examination of the problem of unemployment would hardly be satisfactory without some reference to the possible measures which may be taken to remedy the evil. The ideal to be aimed at is undoubtedly the restoration of industry to ordinary working conditions, so that a full output can be disposed of at remunerative prices. In what way, if any, can a return to good trade be hastened by State action? Temporarily, the State can stimulate trade in at least two ways: on the one hand, it can place huge orders in various directions as happened during the war, when the State was the largest customer of most industries; on the other hand, it can inflate the currency and cause prices to rise, which encourages industrial expansion. This also tended to happen during the war. These "remedies," like alcohol and drugs administered to human beings in strong doses, stimulate the patient for a time, but then have very unpleasant after-effects, the patient ultimately feeling more miserable than he did originally. Industry is suffering now from the unpleasant after-effects of big Government orders and of war-time inflation. The war-time trade prosperity was entirely artificial, and just as a repetition of strong doses of alcohol or drugs would sooner or later kill the patient, so a repetition of excessive Government orders and inflation would sooner or later lead to national bankruptcy. As a State drugging of industry with excessive orders and inflation cannot restore natural trade prosperity, and will ultimately involve most pernicious consequences, such a policy cannot be recommended, and it is therefore necessary to explore other possible lines of action.

The methods of dealing with unemployment can be divided into two classes: (1) those concerned with the eliminating of the causes of the evil, and (2) those concerned with alleviating the evil when it has arisen. Whilst it is obviously true of unemployment, as of illness, that prevention is better than cure, the difficulty

is to discover preventive measures of an adequate and practicable kind; it is consequently necessary to fall back on palliatives to a larger measure than would at first sight appear desirable.

1. (a) The causes of general depressions of trade might be counteracted, to some extent at least, by regularising the national demand for labour. If the Central and Local Authorities arranged programmes of their less pressing work for several years in advance, for a period roughly corresponding to a cycle of trade, and gave out as little of the work as possible during good years, and as much as possible during lean years, something would be achieved towards diminishing the severity of the slumps.

(b) The time lost between losing one job and finding another could be reduced by an efficient system of Labour Exchanges which would place workers looking for jobs and employers seeking labour promptly in touch with one another. Efficient Labour Exchanges could also help to dovetail together winter and summer seasonal employments, and to eliminate casual labour by concentrating the demand for and the supply of labour in a few definite places.

(c) Training centres might be established with the twofold object of assisting workers to acquire a new trade, where their old one was overstocked, or personally unsuitable, and of placing inefficient workers upon their feet by giving them the training they previously lacked.

We have not space critically to examine any of these suggestions, to the carrying out of which there are undoubtedly serious practical difficulties. At the moment, however, when the country is suffering from an acute outbreak of unemployment, the immediate problem is to find palliatives; it is a case for bottles of medicine and not for preventive measures.

2. (a) Manual workers are not the only people who suffer from irregularity in employment and in income. The professional classes, for example, are subject to similar fluctuating conditions. Their way of meeting the problem is to lay by some of their income in good times in order to provide for bad times. This arrangement, even if successfully carried out, does not eliminate lack of work at certain periods, but it does do away with the worst consequence of unemployment, viz., absence of the means of buying the necessities of life. In the first place, it is open to manual workers, as individuals, to adopt the same method. In the second place, as an alternative or in addition, they may adopt a plan by which they form themselves into groups and provide jointly against the risks of unemployment. This is a system of voluntary insurance such as the out-of-work benefit schemes provided by trade unions. In the third place, the State may intervene and establish a system of compulsory insurance, financed from contributions made by workers, employers, and the

State itself. Under the existing State unemployment insurance scheme, so far as different trades are covered, all adult workers on the one hand, and all employers on the other, pay equal contributions, although the liability to unemployment varies considerably from industry to industry. It has been suggested that each industry should assume financial responsibility for its own unemployed, and in theory, if not in practice, there is a good deal to be said for the suggestion.

(b) When there is not enough work to provide employment for all in an industry, the work may be rationed, so that all may be employed part-time, instead of some being discharged whilst the rest work full-time.

(c) Relief works may be established, though this method is by no means free from difficulties. The selection of the work is one difficulty; the fact that it is almost impossible to find suitable tasks for skilled workers is a second; the fixing of rates of pay is a third; the costliness of such undertaking is a fourth; and arising out of that, the question as to what Authority is to finance the relief works is a fifth.

(d) Relief orders may be placed by Public Authorities, the work to be carried out by the ordinary channels of industry and not through special undertakings as in the case of relief works. The orders given out would be either to supply in advance future requirements of the Central and Local Authorities, or else to provide a stock of standard goods to be sold at home or abroad when trade conditions were more favourable. The former type of orders, which are along the lines of the scheme for the regularisation of the national demand for labour referred to above, would appear much to be preferred to the latter type of orders. Production for stock is a very ticklish operation, liable to depress the market at a later date, and to cause the holder of the stock heavy losses through depreciation. Production for stock may easily develop into a gigantic speculation; private producers, when they themselves shoulder the risks involved, are the only people likely to handle the delicate problem with the right combination of boldness and caution.

(e) The State may create or guarantee fresh credit in favour of industry and trade. This policy appears to be first cousin to the currency inflation policy referred to previously. It is doubtful whether there is any lack of credit facilities at the present time; the trouble seems to be that there are no sound uses to which fresh credit can be put.

(f) Experience shows that it is not easy to harmonise "relief" and "work," so that "relief works" may be abandoned in favour of, or supplemented by, "relief" or "maintenance," as it is nowadays frequently called. The assistance provided by Boards of Guardians and the "out-of-work donations" paid



by the Central Authority after the Armistice are examples of relief or maintenance. Abuses very easily creep into the system of granting relief or maintenance, as the conditions described in the Poor Law Report of 1834 clearly show, and a very efficient administration is necessary, if the worst dangers of demoralising the recipients and of undermining the incentive to work are to be avoided.

### III

The responsibility for unemployment cannot be laid at the door of any one party. Unemployment appears to be primarily the price we have to pay for being an industrial state largely dependent on foreign trade. The evil is practically unknown in self-supporting agricultural communities. Employers, workers, and the Government, by their actions or want of actions, may accentuate the evils of unemployment, but the fundamental causes appear to be beyond their control. It is not as if the problem had not been carefully investigated and studied. The trade depression of 1904-5 led to the appointment of a very strong Royal Commission on the Poor Laws and the Relief of Distress, which reported at stupendous length in 1909. The two chief recommendations in relation to unemployment—the establishment of Labour Exchanges, and the introduction of compulsory unemployment insurance—were carried into effect, yet we are now suffering from more acute unemployment than that recorded at any previous outbreak.

It is difficult to avoid being pessimistic in contemplating the somewhat gloomy picture we have had to draw; acute unemployment is a great social evil; several of the so-called "remedies" are liable to recoil with the most serious consequences upon the community that applies them, yet efforts must undoubtedly be made to alleviate the distress. The one reassuring thought in the situation appears to be our knowledge, gained from considerable experience, that just as bad trade follows good, so good trade follows bad. As the slump came so suddenly, it is not unreasonable to hope that there will soon be a turn in the tide of trade.

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## Timgad: the Pompeii of Algeria

By F. W. Hall, M.A.

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TIMGAD, or Thamugadi, as its founder called it, was until recent times a buried Roman city in Algeria, about a hundred miles from the northern coast, and a little more than twenty from the nearest French settlement at Batna. Now that it is uncovered it is the most curious sight in North Africa and can be compared only with Pompeii, that famous city on the bay of Naples, overwhelmed by the ashes from the great eruption of Vesuvius in A.D. 79, which the Italians have been gradually uncovering for the last fifty years. In some ways Timgad is more typically Roman than Pompeii. Pompeii had grown out of an earlier Oscan town. Its architects never had a free hand, and it is in consequence full of odd corners and straggling spaces. It was a city of pleasure for the idle rich and is built of brick. Timgad is a model town, the greater portion of which was built at the same time, and on a definite plan at the command of an Emperor. It was therefore compact and well arranged as befitted a town that might at any moment have to turn itself into a fortress if attacked by the savage hill tribes to the south. It was founded in the year A.D. 100 by the Emperor Trajan, and is built entirely of stone. In the proud words of the inscriptions still to be read on the arches to the West and North, "The Emperor Cæsar Nerva Trajan Augustus Germanicus, son of the Divine Nerva, Sovereign Pontiff, invested for the fourth time with Tribunician Power, thrice Consul, Father of the Fatherland, founded the colony of Marciana Trajana Thamugadi by means of the third Augustan legion, when Lucius Munatius Gallus<sup>1</sup> was legate of Augustus with prætorian powers." This Gallus was what we should call the Army Corps commander in the Province. The town was almost certainly completed before the Emperor's death in 117.

It was founded in consequence of a change made by Trajan in the scheme of defence of the southern frontier of Numidia. The great Aurasiatic range of mountains which runs almost due east and west was then as now the natural line of defence against incursions from the south. Rome held the frontier, as

<sup>1</sup> Not to be confused with the soldier-poet Gallus, the friend of Vergil, on whom see *DISCOVERY*, vol. i, p. 3.



every conqueror must hold it, by means of the great military road skirting the northern slopes of the mountains. The headquarters of the Roman military force in the province, the third Augustan Legion, had been fixed by Augustus at Theveste (now Tebessa), at the eastern end of the Aures range. Trajan moved the legion westward, probably to the neighbourhood of Mascula (the modern Khenchela), and while it was there perhaps a detachment from it was stationed on the site of Timgad in order to guard the Fom-Ksantina gap. In A.D. 100 a colony was founded at

lowed, the town would have been divided into four more or less equal squares by the cruciform intersection of the two main streets, which correspond to the two main roads that always intersect a Roman camp. But here the street which runs from north to south (the *Kardo maximus*) is not continued, as it should be, in a straight line after meeting the Forum in the centre of the town, but is diverted to the west. The street from east to west (the *Decumanus maximus*) runs nearly straight and was the most important in the town because it was a section of the great road



MERIDIAN STREET AT TIMGAD.

(By the courtesy of the Clarendon Press, Oxford.)

Timgad. It was the usual civil settlement which was essential to a permanent Roman camp. It was not a garrison town, though built so as to be easily defended, but was the commercial centre and recruiting-ground for the neighbouring camp and the nursery of Roman civilisation in the surrounding region. By A.D. 123 the camp of the legion was fixed thirteen miles westward of Timgad, at Lambæsis.

Like all Roman military colonies, Timgad is built like a Roman camp. In its original form it is almost a true square occupying about thirty acres. The gates in the centre of the northern, western and eastern sides still survive. If the normal plan had been fol-

lowed, the town would have been divided into four more or less equal squares by the cruciform intersection of the two main streets, which correspond to the two main roads that always intersect a Roman camp. But here the street which runs from north to south (the *Kardo maximus*) is not continued, as it should be, in a straight line after meeting the Forum in the centre of the town, but is diverted to the west. The street from east to west (the *Decumanus maximus*) runs nearly straight and was the most important in the town because it was a section of the great road

from Lambæsis to Theveste. The main stream of traffic passed through it, and many of the more important public buildings are to be found in it or grouped near it. A number of side streets parallel to the *Decumanus* or to the *Kardo* divide the area of the town into small square *insulae* or house-blocks, containing as a rule two houses apiece. There were no slums in Timgad because there were no poor in a population consisting mainly of merchants and time-expired soldiers. The general effect is a pattern like a chess-board, disturbed here and there by the larger spaces taken by the Forum and by public buildings such as the theatre, the market, and the public library. This

chess-board pattern is still the most convenient plan for a military town, and the French have adopted it at Batna. The *Decumanus* and the *Kardo* are both carefully paved with large slabs of blue limestone laid so that their edges run diagonally across the street, in order to secure greater strength against the impact of wheeled traffic. This pattern of paving is still to be seen in the main streets of Naples. It is far superior to the irregular pavements of Pompeii. These two streets with their lofty colonnades on either side—a fashion of architecture introduced probably from the East, after the conquest and foundations of Alexander had taught Eastern builders to copy Greek models—must have been one of the most striking features of the little town. Even in its decay the *Decumanus*, as one looks down it with the sun setting behind the great western arch, has an air of grandeur to which few other ruins of the same size can pretend. The town was well supplied with water from public fountains which drew their supply from the neighbouring Ain-Morris. It had also a very complete system of drainage. The sewers which ran beneath the main streets were built of stone, and still survive as perfect as when they were first used. They carried the sewage, and still carry surface water, down to the plain below. At frequent intervals, in the streets above, there are pierced flag-stones, leading to manholes, which served for ventilation and inspection. Enough is left of the public latrines by the side of the Forum to show that they were constructed on the grand hygienic principle of *tout à l'égout*. One feature of the town will strike the modern visitor who, perhaps, thinks that municipal hygiene is an entirely modern invention—the size, number, and splendour of the public baths. These establishments must have played a great part in the life of a citizen of Timgad. On one of the broad steps on the north side of the Forum is a rudely chiselled inscription which reads: "HUNTING, BATHING, GAMING, LAUGHING, THIS IS LIFE." But there is death as well as life in such enervating ideals; and even the most modern town need not wish to be as advanced as Timgad with its eleven public baths, some of them of considerable size and with luxurious appointments. The bath in Roman lands provided all classes of citizens with a centre where they could have not only an elaborate bath—more or less after the fashion of the modern Turkish bath—but also enjoy the advantages of a gymnasium, a social club, a lecture-room, and art gallery. While on the one hand it promoted cleanliness, health, comfort, contentment, and even education, on the other it cannot be denied that it must have led to endless scandal-mongering in a small town, and fostered habits of idleness and self-indulgence which caused a mortal lassitude in public and private life. The most impressive remains of

ancient baths are, of course, at Rome, where the great hall of Diocletian's *Thermae* still survives almost intact in the Church of S. Maria de' Angeli near the main railway station. When the size of the town is taken into consideration, the baths built outside the northern gate of Timgad at some time in the second century are quite as luxurious. They cover an area twice the size of the Forum. They contain thirty-two smaller rooms, used for changing, for the various stages of the bath, and also for stores and service, grouped round three magnificent halls.

But Timgad provided not only for the material comfort of its citizens, but for their intellectual improvement also. On the left hand of the *Kardo*, just before it strikes the Forum, is a semicircular building with a large forecourt which for a long time puzzled the French excavators. It is now proved by an inscription to be the public library of the town, built out of a large legacy left by a patriotic citizen named Rogatianus. The library proper is in the semicircular apse. In the wall are spaces once occupied by bookcases. In the centre between two columns there was doubtless a statue of Minerva. To the left and right of the reading-room were rooms used for storing books. It was the resort of idlers as well as students, and, unfortunately, we know more of the idlers, who have scratched or chipped their worthless thoughts on the columns of the forecourt, than we know of the students.

The last feature in the plan of the town on which I wish to dwell is the admirable system of public markets. There were shops, of course, in the main streets, especially in the *Decumanus*. But the needs of the town were largely supplied by three public markets. The most important of these is just outside the original walls, to the south of the western arch. It was built by the generosity of a private citizen named Sertius. Its plan comprises a large, wide open space with a fountain in the centre, surrounded by colonnades and beautifully paved with blue limestone. There are shops to the north and south of the square. Those in the south are arranged like a fan in a semicircular building with a roof supported on columns. The shops had no doors, but stood open to the air, with broad counters of stone fixed upon stone uprights. The shopkeeper had to crawl below with his goods and crawl back with them when the market closed, since there are no signs of any provision for storage. There is an even more elaborate market at the west end of the *Decumanus*, with two semicircular buildings filled with similar stone booths.

How did Timgad perish, and how is it that we can walk its streets to-day with the feeling that the traffic there stopped but yesterday? It prospered for more than four centuries, surviving apparently (for it is

hardly mentioned by ancient writers) the attacks of those horrible Christian zealots, the Circumcelliones, and also the brutalities of the Vandal invasion. In 533 Belisarius destroyed the Vandal power by his victory near Carthage, and proceeded by means of his lieutenant, Solomon, to bring the whole of the province of Africa under Byzantine rule. This alarmed the Berber tribes of the Aures, the eternal enemies of every dominant power in North Africa, whether Carthaginian, Roman, Vandal, Arab, or French, and they swept down from their mountains in 535 and burnt Timgad in order to prevent the Byzantines from occupying it. Solomon took possession of the ruined town, but did not rebuild it. He erected a large and powerful fortress to the south, and a new town, with Christian monasteries and churches, sprang up round it and enjoyed a semblance of life for another century. Then came the Arab invasions at the end of the seventh century. For a while the province resisted bravely. The Berbers under their romantic queen, The Kahinah, killed the famous Marabout Sidi Okba in an ambush near Biskra, and in alliance with their former enemies, the Greeks, defeated another Arab general, Hassan ibn en-Noman, at Meskianah in 696. Two years later, however, Hassan returned and routed the Berbers. The Kahinah fled to her mountains cursing the large wooden idol of her tribe, that was always carried before her on a camel. From the heights above she may have seen Byzantine Timgad sinking in flames as her ancestor had seen the old town sink a century before. Then the long night of Islam descended upon both for twelve hundred years. Columns and walls were overthrown by earthquakes and covered by the earth brought down by the rains from the neighbouring hills. The wild vegetation of the surrounding steppe crept over the ruins till little else could be seen above the soil but the great western arch usually known as the Arch of Trajan. Fortunately the Arabs who inherited the land were wanderers who did not seek to build towns for themselves. They were content to pitch their flat brown tents above the ruins, and pasture their flocks of goats and herds of camels. The excavations authorised and subvented by the French Government began in 1880 and have been continued to the present time. They have thrown a flood of light upon Roman life and history by disclosing the authentic features of a daughter city of Imperial Rome.

For a detailed description of the ruins of Timgad see *Guide Illustré de Timgad*, by Albert Ballu (published by Neurdein Frères, Paris), and for further information on town-planning in antiquity see *Ancient Town-planning*, by F. Haverfield (Clarendon Press, Oxford).

## Suggestion and Autosuggestion

By Robert H. Thouless, M.A.

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It has for a long time been known that a statement uttered in a confident manner by another person tends to be accepted by us as true quite independently of any rational grounds for believing it (such as our knowledge of the credibility of the speaker). Such acceptance by our minds of another person's proposition in the absence of adequate grounds for its acceptance is called by psychologists *suggestion*.

We will consider a typical case of suggestion in everyday life. We want to buy something in a shop. The salesman asks a price which we know is much in excess of its true value. We question his price. He insists in a firm, confident manner that not only is he not overcharging us, but that he is asking less than the true value of the article and that he will lose heavily on the sale. He continues to repeat this, and in time it has happened to most of us that we have bought the article. It was only later when we were out of reach of the salesman's suggestions that we have realised (what we knew at first) that we have paid far more than the article was worth, and that we have been victims of a suggestion. It is clear that, in this case, we have not argued to ourselves that the salesman is probably telling the truth. On the contrary, we know that it is in his interest to be lying. His remark that he will lose on the sale is clearly untrue. We have accepted his statement by no rational process, but by the process of suggestion—the acceptance by our minds of a course of action simply because it has been proposed to us a sufficient number of times in a sufficiently confident manner.

In suggestion, the idea of a belief (or, as in the example just given, a course of action) presented by some other person actually produces in our minds that belief (or that course of action). This passage from an idea to its reality may be called "realisation." It is in this specialised sense that the words "realisation" and "realise" will be used in this article. In suggestion the idea of a belief, a course of action, a state of feeling, or the cure of some ailment is presented in such a way by another person that it is "realised" by the person receiving it.

We find that there are wide differences in the readiness with which suggestions are accepted by different persons, and by the same person under different circumstances. These are generally called differences in "suggestibility." Suggestibility varies



with age and sex ; children are more suggestible than grown persons, and women are more suggestible than men. Suggestibility is also heightened by anything which increases the prestige of the person from whom the suggestion is received, and by practice. A person who has been put frequently into a state of hypnosis becomes increasingly suggestible.

The state of half-waking which immediately precedes and follows sleep is a condition in which suggestibility is very high. A similar state can be induced artificially and is called light hypnosis or the hypnoidal state. What is called deep hypnosis is a state resembling sleep. Both of these are states of high suggestibility. Hypnosis can be induced by fixing the eyes on a bright point, such as the flame of a candle or the bright reflections in a crystal, by listening to a continuous or rhythmically varying sound, such as the ticking of a clock or the sound of waves breaking on the seashore, or by rhythmical passes performed before the subject's face and body. It can also be produced simply by suggestion in a sufficiently suggestible subject. The operator has only to order such a subject to sleep, and he immediately falls into the hypnotic sleep.

Suggestion has been used as a method in the cure of diseases, and it is in this connection that we shall be principally concerned with it in this article. When a doctor wished to treat a patient by suggestion, it was at one time usual to put him into the hypnotic trance ; more usually at the present time he is put only into the state of light hypnosis. In either case, the object is to increase the patient's suggestibility so that the curative suggestions of the doctor may more readily take effect. One objection to the use of suggestion in the cure of disease, and particularly of suggestion under deep hypnosis, is its tendency to increase the patient's suggestibility, with consequent weakening of his independence of character.

This objection is overcome if the suggestion is performed by the patient himself instead of another person. When this is done the process is called *autosuggestion*. There are serious difficulties in the way of successful autosuggestion, but these can be overcome, and we are then provided with a valuable weapon for the cure of some kinds of disease. In the present article, I am going to describe the methods of autosuggestion employed in the New Nancy psychiatric clinic. These are explained in a recent book called *Suggestion et Autosuggestion*, by Charles Baudouin, which has been translated into English by Eden and Cedar Paul. The page references in the present article are to the English translation.

The principal novelties in the New Nancy treatment of suggestion are: their increased emphasis both in theory and practice on autosuggestion, and their

enunciation of certain laws of suggestion which will be described later.

In what is ordinarily called suggestion Baudouin distinguishes two steps. First, an idea imposed by the operator is accepted by the subject. This he calls *acceptation*. Secondly, the object of the idea is realised. This he calls *the ideoreflex process* or simply *suggestion*. He considers that the second of these steps is the more important one, and that earlier accounts of suggestion have gone astray by fixing their attention too exclusively on the earlier step of *acceptation*, and regarding that as the important thing in suggestion. The second step is of course a subconscious one. If we accept this distinction and follow Baudouin's use of words, it will be necessary to modify the terminology used earlier in this article. Then we called a person suggestible if he realised readily a suggested idea. But Baudouin uses the word *acceptivity* for the property of accepting a suggestion readily, and reserves *suggestibility* for readiness in carrying out what he calls the ideoreflex process. A person may be highly suggestible in this sense, and yet not be easily influenced by other persons, because his acceptivity is low. It is acceptivity, and not suggestibility, that is an undesirable quality if too highly developed.

If the subject himself puts into operation the ideoreflex process, we have *autosuggestion*. Autosuggestions may either be spontaneous or the result of our own deliberate effort. These are distinguished as *spontaneous* and *reflective autosuggestion* respectively. The case of spontaneous autosuggestion is the simpler one, so we will consider it first.

Spontaneous autosuggestion is a process occurring in the lives of all of us fairly continually, when any idea which has happened to catch our attention realises itself. An opinion, for example, which we have heard often repeated tends to become a belief. When we see a fire freshly lighted, we begin to feel warmer even though it has not really begun to throw out any heat. An illness that we are always talking and thinking about tends to develop.

There are four laws of suggestion developed by Coué (the founder of the New Nancy school) which are so important that I will give them in full:

(1) *The Law of Concentrated Attention*. "The idea which tends to realise itself in this way is always an idea on which spontaneous ATTENTION is concentrated" (p. 114).

(2) *The Law of Auxiliary Emotion*. "When, for one reason or another, an idea is enveloped in a powerful EMOTION, there is more likelihood that this idea will be suggestively realised" (p. 114).

(3) *The Law of Reversed Effort*. "When an idea imposes itself on the mind to such an extent as to give rise to a suggestion, all the conscious efforts



which the subject makes in order to counteract this suggestion are not merely without the desired effect, but they actually run counter to the subject's conscious wishes, and tend to intensify the suggestion" (p. 116).

(4) The *Law of Subconscious Teleology*. "When the end has been suggested, the subconscious finds means for its realisation" (p. 117).

The first three of these laws may perhaps best be illustrated by a case of spontaneous autosuggestion of a particularly unpleasant kind which in some form has occurred to the experience of most people. We may suppose that you have been told to walk along a plank 6 inches wide, resting on the floor, without stepping off on either side. You will find that you are able to do so without any difficulty. If, however, a plank of the same width and of the same rigidity were supported at a great height above the ground so that there was a sheer drop of several hundred feet on both sides, and you attempted to walk along it, you would certainly fall off. This is a case of realising the idea of falling off by spontaneous autosuggestion. Spontaneous attention is unavoidably caught by the idea of falling off, and there is a very powerful emotional accompaniment (of fear or horror) to this idea. These are the conditions described by the first two laws as those under which ideas become realised by spontaneous autosuggestion. If either you could manage not to think about falling off at all, or if you could think about it without any powerful emotion, the danger of falling off would be less. At the same time, the law of reversed effort is illustrated by the fact that your voluntary efforts to retain your balance will not only be useless, but will tend to defeat that end.

As an example of the Law of Subconscious Teleology, we may take a case where what is suggested is either the formation or the cure of some bodily symptom in a disease. It is common for Swiss girls both to produce and to cure warts by autosuggestion. It is clear that they have no knowledge of the bodily changes which produce the warts. The law asserts that this is not necessary for successful autosuggestion. When the end (the formation of the wart) has been suggested, the subconscious finds the means for its realisation (the bodily changes which will produce it). This is obviously a law of the first importance for the use of autosuggestion in the cure of diseases.

The ways in which Dr. Baudouin finds that spontaneous autosuggestion affects us in ordinary life are numerous. The habit of discussing and giving names to our ailments produces an atmosphere of spontaneous autosuggestion of disease which is probably very fruitful in the production of disease. Even when there is an organic ground of disease, the pain in the diseased part attracts attention to it, and thus spon-

taneous autosuggestion adds something to already existing diseases. He also mentions clairvoyants and such people, whose prophecies tend to germinate in our minds and to realise themselves, so that a prophecy of misfortune may result in that misfortune. There are, of course, also spontaneous autosuggestions which are desirable—thoughts of strength, success, health, etc. It is possible to combat the effects of noxious spontaneous autosuggestions by means of *reflective autosuggestion*.

The difficulty in the practice of reflective autosuggestion is to find an efficient substitute for spontaneous attention. If a voluntary effort is made to think of and realise an idea, the law of reversed effort shows us that it will not be successful. It is for this reason that many persons fail in autosuggestion. They are told to concentrate on an idea. For them concentration means an intense voluntary effort to think of it; and intense voluntary effort is the condition under which autosuggestion is most certain to fail. Those who have experienced the effects of intense voluntary effort to go to sleep know the condition of hopeless wakefulness which such an effort induces. It will be noticed later that Baudouin himself uses the word "concentration" for a method of reflective autosuggestion, but he is careful to explain that he does not mean by it any kind of voluntary effort. The practical problem to make successful reflective autosuggestion possible is to discover some condition in which voluntary effort is as small as possible, but in which the mind can be kept occupied with the particular thought to be suggested.

The condition between sleeping and waking, which we have already noticed as one of high suggestibility, is a state in which spontaneous autosuggestions are particularly liable to realise themselves. All writers on autosuggestion recommend that a similar state should be induced, in which there is a certain emptiness of mind and suspension of the mental functions. Sometimes, however, they write as if this were a state to be attained by an act of will, and their followers find themselves misled into making strenuous efforts where a relaxation of effort is the principal necessity.

One of the characteristics of this half-waking condition is what is called the *outcropping of the subconscious*. The mind ceases to be occupied with the directed thinking in words which is a voluntary activity, and instead becomes filled with a succession of vague images which are surface effects of the repressed material in the unconscious. A similar condition is found in reverie, that is, in the state in which we have relaxed the voluntary activity of the mind. It is found that those to whom this state of outcropping is most normal are those to whom autosuggestion is easiest, as artists, women, and children.

The first step which Dr. Baudouin suggests in the practice of autosuggestion is an education of the outcropping by the production of these states. This is done by keeping the body motionless and the muscles relaxed while we are resting on a comfortable armchair under conditions as free as possible from such external distractions as noise. The eyes are closed, and the effort of thinking is relaxed, while the mind is allowed to occupy itself with the vague images which float past it. Baudouin speaks of this state of outcropping produced by such a relaxation as *le recueillement*.<sup>1</sup>

*Le recueillement*, however, is merely a preliminary stage. The equivalent of attention of which we are in search is a condition of monoideism in which we have this condition of outcropping and, at the same time, the mind without effort is permeated with a single idea. This is what Baudouin calls *la contention*. It is what books on autosuggestion mean generally when they speak of concentration. Sometimes, on waking up after sleep, the mind is found to be in this condition; directed thinking is at a minimum, and at the same time the mind is exclusively occupied with one single idea. This is the condition under which the idea occupying the mind will realise itself as an autosuggestion. In order to be successful in the attainment of the state of *contention*, it is necessary to cultivate both the power of attention and of relaxation. It is suggested that the former should be cultivated by such exercises as learning by heart, and the latter by the practice of *le recueillement*.

So far we have described *la contention* without indicating how it may be attained. This may be done by the permeation of the mind without effort during the period between sleep and waking by the idea which we wish to realise, the idea, for example, of the cure of some illness or weakness. The difficulty is to find a way of keeping the mind permeated with an idea without the effort of attending to it. The way to do this is to sum the idea up in some formula which is repeated over and over again. If we wish to attain *la contention* at other times in the day, we may do so by producing outcropping by the practice of *le recueillement*, and then permeating the mind with the desired idea in the same manner. It is easier, however, to do so if the state of outcropping is not produced by relaxation, but by a method of immobilisation of the attention which has already been described under the name of *hypnosis*.

For the production of the state of hypnosis, the attention is immobilised, i.e. is kept fixed for some time on one object until it relaxes itself spontaneously through loss of interest (and probably fatigue). When

it relaxes itself, a state of outcropping is produced similar to that in *le recueillement* or *reverie*. It has this difference, however, that it favours the attainment of *la contention* with an idea more than does *reverie*. The reason for this is that in *reverie* we tend to have dispersion of mind, while in hypnosis the idea of immobility with which the state started remains dominant, hence it is easily re-established when we wish to transform the state into one of *contention* for the purposes of autosuggestion.

There is one more mental state described by the author of *Suggestion et Autosuggestion*, which combines the characters of those already described. This is one in which hypnosis is produced by the fixation of the attention not on an external object, but on the idea which is to be the object of the suggestion. To this state he gives the name of *la concentration*. Notice that it is not the state of intense voluntary attention to which we generally give the name of "concentration." This is a fact of great importance for the successful practice of reflective autosuggestion. Dr. Baudouin defines it as follows: "a state of autohypnosis, and of persistent *contention* with one idea, the autohypnosis having been induced by the lulling influence of the idea on the mind." The simplest way of producing *la concentration* is to sum up the idea in a short phrase, and to repeat it over and over again, either aloud or sketching its pronunciation with lips and tongue.

An important practical question for autosuggestion is that of the formula in which the suggestions should be embodied. We will suppose that we are suffering from toothache and wish to autosuggest it away. If we use the formula "I want to be free from this," we shall find that this is too weak to be effective. If we go to the opposite extreme and say, "I have no toothache," our present experience of the toothache contradicts us. We shall find that we cannot accept the suggestion. This is the objection to the Christian Science formula, "There is no disease." Most of us are unable to accept a suggestion in this form because it contradicts our experience. This inability to accept a suggestion which does not harmonise with the knowledge we have obtained through our earlier experience is what is called in popular speech our "critical faculty." A suggestion in this form will be successful only with those whose critical faculty is abnormally undeveloped. For more ordinary people it is necessary to adopt some formula which is intermediate between these two extremes. The kind which has been found most generally useful is one which asserts that the undesired condition is growing better. In the case of toothache, we may use the form, "This is passing away." If we wish to use autosuggestion to help ourselves to sleep, we may use the formula,

<sup>1</sup> I have retained the original French for Dr. Baudouin's technical terms, since their English equivalents suggest meanings remote from those intended.

"I am falling asleep." A detail insisted on by the New Nancy School is that the formula should be gabbled. This is to prevent the spontaneous autosuggestion contradicting the formula from arising in the mind between each repetition of it. For example, if when we are trying to go to sleep we repeat slowly, "I am falling asleep," it will be difficult to prevent the mind from thinking between each repetition, "I am not really, I am still as wide awake as ever." If this happens, the spontaneous autosuggestion of remaining awake will realise itself and defeat our efforts to realise the reflective autosuggestion of falling asleep.

The following are the uses of reflective autosuggestion. It can undo the evil work of noxious spontaneous autosuggestions, the illnesses which are the result of preoccupation with our health, and so on. It can be used for the cure of all functional disorders such as tics and hysterical paralyses or swellings. It is also of value in certain organic complaints. It can always help the natural process of cure, and it can undo the part played even in real organic disorders by spontaneous autosuggestion. Dr. Baudouin claims that it can cure pimples, warts, varicose ulcers, and eczema. It may also be used as a means of removing bad habits, and of obtaining complete control over sleep.

In the New Nancy School, it is not recommended that particular suggestions for the removal of specific troubles should be frequently repeated. After a trouble has been made the subject of a particular suggestion, it is claimed that it is sufficient to repeat about twenty times every night and morning the general formula: "Day by day, in all respects, I grow better and better." We are directed not to gabble this, but to repeat it piously, mentally underlining the worlds *in all respects*, and making them refer to all the troubles which it is desired to remove.

In this short space, it has only been possible to give the barest outline of a work of fascinating interest. The writer of this article will feel that his work has been of most value if it leads many readers to read Dr. Baudouin's book for themselves. It is absorbingly interesting, and its lucidity makes it an easy and a delightful book to read.

#### BOOKS RECOMMENDED

- Suggestion et Autosuggestion*, by Charles Baudouin. English translation by Eden and Cedar Paul. (Kegan Paul, Trench, Trubner & Co., Ltd., 15s.)
- Instinct and the Unconscious*, by Dr. W. H. R. Rivers. (Cambridge University Press, 16s.)
- An Introduction to Social Psychology*, by Professor W. McDougall. (Methuen & Co., Ltd., 8s. 6d.)

## An Eighteenth-Century Character

By Rowlands Coldicott, M.C., B.Litt.

(Continued from the September number)

As a physician in orders, the future satirist of George the Third held during his Truro period a somewhat peculiar position. He dressed in black and wore ruffles, and was not particularly pleased to say grace when people asked him. The real object of his life during the eight or nine years that elapsed before his final departure for London was the accumulation of sufficient money to place him "beyond the caprice of a mob." To compass this end there is evidence that he lived with great parsimony in his own house, though his wit and verse and personality made him very frequently seen wherever amusement was toward. He shared in full the not unlively society of a West-country town in the last quarter of the eighteenth century. There were picnics and boating parties, dances on the green by moonlight, and much eating and drinking in neighbours' houses. This society and the excitement of local politics and scandals furnished Wolcot with plenty of material for eloquent epistles and virulent lampoons. The epistles, addressed to Sukey or Joyce Nankivell, Miss Dickenson or Betsy Giddy, were of this nature:

When sweet Cecilia<sup>1</sup> sought the skies,  
In tears were all the tuneful wits;  
The fiddles poured chromatic sighs,  
And music had hysteric fits.

But, 'ere she vanished, thus she said:  
"A short farewell I mean to bid ye."  
To keep her word the harmonious maid  
Appears in form of Betsy Giddy!

These were pleasant enough, but his lampoons gained him the ear not only of a few friends, but of all that local public. Most have disappeared, but four more than usually popular ones have survived in old books of reminiscence. These are, in order of composition, "The Dame of Fowey," "The Roast Pork of Old Truro," "A Christmas Carol," and "The Hall." The last was part of a combat between him and the Corporation; "measter auld cat," as the peasants called the doctor, had refused to take an apprentice, who, according to the custom of the time, were assigned to doctors by lot. The Corporation of Truro had been remarkably patient, but at last they became exasperated. Early in 1779 they commenced a prosecution

<sup>1</sup> St. Cecilia, martyred at Rome about A.D. 280, became venerated later as the patron-saint of music, and in this connection many poets of the eighteenth century, including Dryden, Shadwell, Pope, and Addison, wrote odes for her day—November 22.



against him, and Wolcot had to use all his social influence and pay over a hundred pounds before the matter blew over. Towards the end of that year one of the periodical drawings for apprentices took place, and Wolcot received this letter:

TRURO. November 28th, 1779.

SIR,

I'm ordered by the Mayor and Deputy Recorder of this Borough, to acquaint you that there will be a regular Drawing for apprentices to-morrow morning by ten o'clock, at the Vestry Room, within the said Borough, when and where you are desired to show cause, if any, why you should not have an apprentice.

JOHN BUCKLAND, Overseer.

To Mr. Wolcot.

But, like a good general, Wolcot had anticipated this, and had decided to remove himself from their jurisdiction. He replied as follows:

SIR,

I have received your official note. Be so good as to present my most humble and respectful compliments to his Worship the Mayor, and also to the Deputy Recorder of this honorable Borough, and inform them that their blunderbusses have missed fire. You will let the Worshipfull Gentlemen know, *that tho'* I can by no means accept their *well meant favour*, I'm truly sensible of the *intended obligation*. As my house is taken by another tenant, the furniture except a few immaterial articles removed to Helston, and the servant discharged, I'm tolerably certain that I do not come within the description of a person entitled to that *good fortune*. I must therefore desire them to transfer their favour to some dearer friend. Should they, however, through *violence of affection* insist on placing an apprentice on the House (for the Mayor and Deputy Recorder of the *honorable and independent* Borough of Truro are almost *omnipotent*) be so good, Mr. Buckland! to attend the aforesaid gentlemen to my door with the apprentice, and desire them to thrust him through the key-hole.

WOLCOT.

To Mr. John Buckland, Overseer of the honorable and independent Borough of Truro.

If this were all, it is doubtful if Wolcot would have come to London or have become famous. But about four years before this an incident happened which changed the whole course of his life. And this, it is pleasant to observe, came about not through self-seeking, but by doing someone a good turn.

The Nankivells, including Sukey and Joyce, lived at Mithian, in the parish of St. Agnes, some eight miles from Truro, and Wolcot often used to ride over to see them. One day Wolcot was criticising a print that hung in the parlour; "a busy scene," he said, "but ill executed," whereupon one of the Miss Nankivells rejoined that "it was greatly admired by many, and particularly by John Opie, a lad of great genius." Wolcot went off at once in search of the boy, and found him working in a saw-pit. He asked him if he could paint, and the boy ran off to get his productions. "I shall always hear," said Wolcot, years afterwards, "the

sound of the boy's leather apron clattering between his knees." The relationship between the two soon developed into that of master and pupil, and before long Opie came to live with Wolcot at Truro. Here in the midst of his doctoring and quarrellings and dinings-out he found time to teach all he knew of painting and drawing to the enthusiastic lad, throwing in also instruction in French and Latin. Opie was a mere boy, but before long he was tramping the district, with no lack of orders from county families. When the final disturbance took place between Wolcot and the Corporation of Truro, Opie moved with him to Helston. In 1780 one of Opie's pictures was exhibited in London at the Society of Artists. About this time Wolcot got into correspondence with a Mrs. Boscawen, who held a distinct position in London society. It seems to have been in the month of December, 1781, that Wolcot and Opie cut themselves adrift from the West Country and tried London as a field for fame and fortune. They made a compact: the earnings of both were to be pooled and halved.

The success of Opie, though he paid for it later by loss of popular favour, was immediate and complete; Mrs. Boscawen took him to Mrs. Delany; an audience of the king followed. Wolcot played his part assiduously and well, calling several times on Sir Joshua Reynolds with Opie's pictures. Reynolds was impressed, and compared him to Caravaggio. The king, careful as always in matters that involved money, smiled and spent a little. Two letters, the first written by Wolcot to a friend at St. Agnes, the second by Opie himself, best describe the situation, and show how piquant the rustic painter must have been to London society.

[Undated, probably February 1782]

I have at length got Jan introduced to the King and Queen. The night before he went, I was employed in teaching him how to make King and Queen bows; to keep his hands out of his breeches pockets, and blow his nose before he got into Buckingham House; in enjoining him, not to make a comb of his fingers, and scratch his pate with his claws, on the approach of their Majesties; in insisting on his not spitting about the carpet, and twirling his hat upon his thumb. All this Jan promised to observe faithfully. As he was carrying his pictures into the room of the Palace, Jan was followed by the Queen, who treated him with great kindness, so much indeed, that he is now turned Quixote, and is ready to fight up to the knees in blood, for her Majesty. The King came in after; with a skip (not a very proper pace I think for Majesty). West was with him, I mean West the famous painter, a monstrous favourite of George's. George asked Jan a number of questions, which (from Jan's history of himself after his return) he answered with a St. Agnes intrepidity. The Pictures were placed in order, and the British Monarch applauded the Artist; the Queen turned up the whites of her eyes marvelling; the little princes lisped praises, and Jan, to be sure, was in an ecstasy. He remained nearly an hour and half with them, and then took his leave. The pictures he carried were: An Old Jew, A



Beggar and his Dog, the Old Kneebone of Helston, and Mat. Trevenen. The Beggar and his Dog the King kept, as well as the portrait of a lady, which Jan painted expressly for him. West was ordered to give Jan the money, and to say that he (George the Third) wished him every success. On Wednesday the boy paints the Duke and Duchess of Glos'ter, and I suppose the children. He waited on them a few days since, and was graciously received by their Royal Highnesses. He is now painting the most beautiful women of the Court, Lady Salisbury, Lady Charlotte Talbot, Lady Harcourt, etc. You cannot think what repute Jan is come into; I told you before I got him introduced; indeed I did, for by recommending him to Mrs. Boscawen's patronage, she made it a point, to oblige me, and immediately introduced him to Lord and Lady Bute, the Hon. Mrs. Walsingham, Lord and Lady Mount Edgcombe, Mrs. Delany, a chief favourite of their Majesties, etc., etc., who, showing her picture done by him, to the King, he was immediately sent for. Now he is established, it will be his own fault if he does not make his fortune.

*Opie to his friends in Cornwall*

[Undated, probably same month]

MY DEAR FRIENDS,

I must ask you ten thousand pardons for neglecting to write you all this while. I shall never forget the obligations I am under to Mr. Penwarne and his family.

I think I am fixed here for the winter; however, whether I will or no, and the only thing I regret is that I cannot see you sometimes; I wish, indeed, I expected to see one of you here before now.

I have been exceedingly lucky since I have been here, I have all the quality at my lodgings every day, nothing but Lords, Ladies, Dukes, Duchesses, etc. I was introduced to Sir Josh. who said many handsome things of me both to my face and behind my back.

But—Loard—I've 'a zee'd the King and Queen, and was with them at the Queen's house and taalked wi'mun two hours and painted vor mun the picture of an old lady and a blind beggar and dog. I am not yet paid for 'em.

West was there at the same time. After the King went out, West asked me the price of the pictures, and said the King wished to be considered as a private gentleman. I had a great mind to ask if the King paid him as a private gentleman. . . . Can I be of any service to you? Any commands that you may have I will gladly execute. If you want anything that I can get for you, be so good as to mention and it shall be done. I hope to have the pleasure of hearing from you soon. Please to give my best respects to Miss Lawrence and Miss Penwarne and Mr. Penwarne, and shall be glad to hear that they are well.

Gentlemen,

I am most sincerely

Yours,

J. OPIE.

Please to direct to me at

Mr. Riccard's, Orange Court, Castle Street,  
Leicester Fields,  
London.

It is worth noting that in Opie's letter there is no mention of Wolcot. The success of the young man had already placed a heavy strain upon the compact of the two to divide profits. It is not known that Wolcot published anything during these first London adventures—probably he was much too busy exhibiting Opie. But though he was still able—probably because the

youth was totally absorbed in painting—to show him about in an uncouth state, his long hair about his shoulders, he could not teach him to be careful with his public. Opie cared in the first place for art, Wolcot for the influence and reputation he expected it to bring. The two men's ideals were dissimilar: by bringing Opie to London, Wolcot had already in effect dissolved partnership.

Curiously enough it was through his attention to the fortunes of Opie that his chance came. Wolcot did not



MEZZOTINT PORTRAIT OF DR. WOLCOT BY OPIE, 1787.

recommence authorship in order to "puff Opie in the Press" as some writers have stated. His first production contains no reference to the "Cornish Wonder," and though he hailed him on a subsequent occasion, it was only in passing. But the artist was nevertheless the remote cause of his choice of subject. Wolcot had throughout his life kept in touch with painting, had himself practised the art, and is even said to have studied at some period of his life under Richard Wilson the landscape painter, whose style he imitated. During his residence at Truro he had corresponded with Northcote, and on Ozias Humphrey's return to England in '77 had greeted him with verses. He was probably well known at the time to other artists. On his arrival

with Opie at Leicester Fields, he passed into the heart of artistic London. By 1782 a public had come together that was willing to patronise art—or at all events to talk about it. The Academy, aided by a few honest pushes from George III., had become fashionable. Twelve years before this date Horace Walpole had noted with some dismay that prices were on the rise. "One West," he says, "gets £300 for a piece not too large to hang over a chimney." The Royal Academy, with Reynolds as its presiding genius, was now in its fourteenth year. Gainsborough, though in the last years of his life, was still in the height of his reputation. Reynolds had not yet ceased producing, and was attracting numerous imitators. West, the chief recipient of the King's bounty, had seen the absurdity of representing modern English gentlemen in Grecian costume. Art was breaking fresh ground in every direction. Nor were younger men wanting to carry on the flame. George Morland was now on the threshold of his career. Caricature had just re-awakened at the touch of Gillray. Rowlandson, who could rival Morland in his own line, turned his attention to it some two years later. A flock of foreigners—"the exotic R.A.'s," Wolcot called them—had come over to England, attracted by the opportunities afforded by the Royal Academy, and some had been received into the body of that institution.

In the general glamour that hung over this varied mass of excellence, it was not easy for the average man to distinguish the light of polished mirrors from the unique and primitive flame. One could hardly go wrong in praising Reynolds, but on the hundred and one other men of varying merit the general public was incapable of passing any intelligent verdict. The artists themselves had set up a certain standard, but the talk of studios is not what the world understands by criticism. The business of painters is to paint, and though an artist may lay aside his tools for a moment and deliver dicta, criticism must ultimately come from outside. Of this independent judgment the public had practically nothing. In 1781, a creature who called himself "The Earwig"<sup>1</sup> had made some abortive remarks in prose on that year's Exhibition. His pamphlet is neither witty, nor instructive, nor entertaining. A strong fearless critic is always welcomed; Wolcot was the one man competent to step forward and take the office. In the *Critical Review* for July 1782, amongst the long, uninteresting lists of minor publications that the magazines of the late eighteenth century were wont to print in their "Monthly Catalogues," appears the notice of a pamphlet entitled "*Lyric Odes to the Royal Academicians*," by Peter Pindar,

<sup>1</sup> The Earwig, or an Old Woman's remarks on the Present Exhibition of pictures of the Royal Academy, etc., etc. Dedicated to Sir Joshua Reynolds. Printed by G. Kearsley, 1781.

a distant Relation to the Poet of Thebes." The size was quarto, the publisher one "Egerton," and the price a modest sixpence. The reviewers at once separated it from the throng, and bestowed on it nearly a page of quotation and comment. They little knew that they were encouraging an author whose pamphlets would besiege their pages for over thirty years, until expectation lost its thrill, and criticism itself was tired out.

(To be continued)

## At the British Association's Meeting

MEMBERS heard with regret that the proposal of last year to fit out a British oceanographical expedition, like the *Challenger* expedition of the seventies, is postponed indefinitely, because the time is unsuitable for an appeal to the Government or the public for the large sum of money necessary.

The prevailing note of most speeches was a cheery optimism. Science was indicating on every hand that she would do great things for man if only he would take himself in hand so that he might use her fruits aright. Several speakers pointed out how important such subjects as Organic Chemistry, Anthropology, Geography, and Physiology had become of late, and how necessary to mankind was the knowledge they furnished. It followed that increased facilities for teaching, and carrying out research in them should be granted to colleges and schools. Dr. M. O. Forster, in the Chemistry Section, after giving a highly technical survey of recent work on the vegetable alkaloids, the nucleic acids, chlorophyll, and the pigments of blossoms and fruits, pressed for more teaching on organic chemistry. He pointed out that, with the exception of air and water, the important things in life were organic—shelter, clothes, food ("baby's milk and grandpapa's Glaxo"). Yet many grew to manhood without "the slightest real understanding of their bodily processes and composition, of the wizardry by which living things contribute to their nourishment and to their aesthetic enjoyment of life." Sir Richard Temple in opening a discussion on the need for an Imperial School of Anthropology pointed out that officials, missionaries, and others intending to take up work among people in the East needed, besides an acquaintance of the language, a knowledge of the racial characteristics of the people whom they sought to serve. The need of the races of Europe for a proper understanding of non-European races could best be met in the British Empire by the establishment in London of a central body to organise a system of training, which could be

done at the universities in Great Britain and throughout the Empire. Pleas for a wider study of geography and physiology and for bringing these sciences more into touch with national life were made by Dr. D. G. Hogarth and Sir Walter Fletcher respectively.

Below are given résumés of some of the sectional addresses and discussions likely to be of interest to readers.

#### THE AGE OF THE EARTH

There are three main points of view: the physical, the astronomical, and the geological. In Victorian days Lord Kelvin startled the world by calculating that the greatest time for which the earth could have been habitable was twenty million years. He based this theory on two ideas: (1) that the earth was losing its primitive heat, like a hot loaf taken from the oven, at a rate which could be calculated, and (2) that the heat radiated by the sun was due to energy produced by its contraction.

Lord Rayleigh, who opened the discussion, pointed out that present-day knowledge of physics extended the period of life on the globe to 1,000 million years, and that the total age of the earth was probably a few times this amount. The earth was not cooling like a hot loaf. It had a supply of heat of its own within it, namely that emitted continuously, spontaneously, and apparently always at the same rate, by the radio-active elements (uranium, thorium, radium, etc.). It was fortunately possible to calculate the age of the rocks which contained these elements, and the Eocene rocks were estimated to be about 30 million years old, and the oldest known rocks 952 million years!

Professor Sollas put forward the geological view. Geologists considered Lord Kelvin's estimate much too low, Lord Rayleigh's much too high. He pointed out that if radio-active bodies originally emitted energy more rapidly than they now do—and there is some evidence of this—Lord Rayleigh's might be reduced. Professor Gregory pointed out that the geological estimate was based on the time required for the deposition of geological formations. The rate at which this went on was assumed to be uniform, but probably periods of slow and quick denudation had occurred in consequence of deformations of the earth, and allowance for these would bring the geological estimate nearer Lord Rayleigh's. Professor Eddington said that present-day astronomy was against Kelvin's time-limit, also against his attributing the sun's heat to its contraction.

#### PROBLEMS OF PHYSICS

Prof. O. W. Richardson's address considered the present state of some of the important problems of physics: the theory of Relativity, the quantum theory, the structure of the atom, the emission of ions from incandescent bodies, the close connection between the phenomena of light and of X-rays. It was, for the most part, extremely technical. Artificial transformation was now an accomplished fact, though it had been effected so far only on an extremely small scale. The transformed element was not merely changed into others, but the energy liberated when this occurred was greater than that necessary to initiate the

process. This energy was very small, but it was enormous in comparison with the quantity of matter involved. A start had been made; if these effects could be intensified and yet be kept under control, an almost illimitable supply of energy was at man's disposal. It was yet too early to say whether or not the conditions for producing this energy on a large scale under control could be realised in practice. Time would tell. We might be at the beginning of a new age which would be referred to as the *age of sub-atomic power*.

Professor A. S. Eddington gave an illuminating account of Relativity, mentioning that the theory made the ether an idle hypothesis unsupported by experiment and giving explanations of nothing. Sir Oliver Lodge said that an exponent of relativity was so immersed in this subject that he thought it self-evident. He was like the cricketer who, being asked to explain a yorker, replied that it was just a "yorker." Sir Oliver was not prepared to abandon the ether.

#### VOCATIONAL TRAINING AND TESTS

Members of the Sections for Psychology, Education, and Economics took part. Dr. C. W. Kimmins opened the discussion. Psychology was permeating everything and becoming embarrassingly popular. Intelligence tests were being used in connection with the admission of defective children into special schools. London, with 800,000 children and 20,000 teachers under one authority, was the finest field in the world for research on this subject. In the old days backward children were sent to special schools without the cause of their backwardness being considered. Now they could tell by intelligence tests whether or not a child had ability apart from the knowledge he had gained. These tests had also been of assistance in transferring pupils to the classes in schools which really suited their abilities. In some cases unlikely pupils in the wrong classes had on transference blossomed into scholarship winners. As regards vocational tests, a recent investigation of his into the after-employment of children in the London area had revealed a tragic state of things. Large numbers of children started work in jobs that were unsuitable to them, and later drifted from one position to another. There were too many misfits; boys of promise became van-boys! The money that we were spending on education would be thrown away unless greater attention were paid to fitting the right boy, as far as it was possible, into the right job.

Dr. C. S. Myers said that a child was badly educated unless he showed special interests or abilities of some kind. A choice of occupation must be made by the boy himself, and he should not be bullied out of it. But naturally information about different occupations must be given him. There should be cinematograph films showing the responsibilities, prospects, advantages, and dangers of various occupations. Neither parent nor teacher could give adequate advice on occupations, because they knew little of industrial requirements. Expert advice and the teacher's co-operation were necessary.

Subsequent speakers talked much of the misery and unhappiness arising from mistaken choice of occupation—



"the round peg in the square hole," but it was ultimately agreed that workers were neither round nor square, but, being malleable, had in time to adapt themselves to fit into either the round or the square position.

#### PREFERENCE OF SUBJECTS IN THE SCHOOL CURRICULUM

Mr. J. Don opened an interesting discussion on the preference of pupils for certain subjects of study. About 3,600 pupils of intermediate classes of 93 schools in the West of Scotland were asked to write down the order in which they liked the subjects—English, French, Mathematics, Science, and Drawing. Answers came from 1,855 boys and 1,760 girls. The boys' order of preference was science, English, drawing, mathematics, French; the girls' order was English and French at the top, science and mathematics at the bottom. No definite reason for the boys' indifference to French or of the girls' indifference to science was given. The high place occupied by English in both lists is ascribed to the excellent way (through literature) in which this subject is taught in Scotland.

#### MUSIC IN EDUCATION

Sir Henry Hadow (Vice-Chancellor of Sheffield University) opened the discussion. He urged that music should be given a place in the curricula of schools and colleges. It was not everybody's subject, but the whole school might well take part in class singing, and listen to an occasional lecture or concert, while those with an aptitude for it might take it instead of some other subject. Taught properly the study of a great composer might be educationally as good as that of a great poet. A syllabus for music could be drawn up to fit into existing curricula without encouraging faddists, excusing idlers, or producing the class that talk emotionally about music without understanding it. Pupils should be encouraged to read good music with the approximate facility of reading a book. Every public library, and, if possible, every school and University library, should contain a musical department which included the standard classical compositions and the first-rate books on musical aesthetics and criticism. The speaker pointed out that the public put up with a standard of music which they would not tolerate in other things. Ninety per cent. of the stuff written on music-paper was not music. A band would submit a programme for a concert which to an intelligent musician was nothing but an insult, and naïvely reply when reproached that they were not aware that first-class music was wanted.

The story with which Sir Henry started his address is worthy of repetition: "Some years ago we were sitting round the fire in an Oxford Common Room. The Dean, who had the evening paper, let his eye fall upon a paragraph of musical criticism, and read it aloud in that tone of polished irony which we all knew to be his accustomed mark of disapproval. It was a harmless paragraph, and contained somewhere an innocent technicality—I think 'sub-mediante.' When he had finished, he looked across to the eminent scholar by the fireside and said, 'Of course, you know what a "sub-mediante" is?' To which came the answer, slow, meditating and pious, 'God forbid.'"

## Reviews of Books

*The Origin and Evolution of the Human Race.* By ALBERT CHURCHWARD, M.D., M.R.C.P. (Geo. Allen & Unwin, 45s.)

This book is a queer jumble of anthropology, archaeology, a little heterodox astronomy, a few knocks at socialism, and personal attacks on several of our distinguished exponents of the pre-history of mankind. Its purpose is to set forth as completely as possible the evolution of mankind. The author's main point is that man arose not in Asia but in the Valley of the Nile, and he attempts to substantiate this and trace man's spread over the earth, both by examining the archaeological evidence which throws light on his various cults, and by considering the so-called savage and backward races, which exist to-day, from many points of view. He feels pretty sure that his conjectures on the origin of man "are true and irrefutable," but, although a reviewer may consider the first of these adjectives too optimistic, it is highly certain from the manner in which the book has been written that it will not be refuted. That would be unnecessary.

The book contains many wild statements that the reviewer feels have been made, not because they represent an assertion that is genuinely felt to be true, but because they fit in with the mood of their utterer and merely express personal dislikes. Dr. Churchward's views on what was happening on the earth six hundred years ago are necessarily speculative, but one may judge approximately of his right to speculate with some measure of probability by what he says of events occurring in historical times that we all know about. Yet here he is very wild, and his descriptions of the Greeks, the Egyptians, and the spread of Christianity are somnambulistic. From these a reader may safely judge the whole book.

It is difficult to see for which class of reader the book has been written. It is too long and too dear for the ordinary reader, too difficult for the man specially interested in anthropology, and too untrustworthy and unscientific for the expert.

A. S. R.

*Relativity and the Universe.* By DR. HARRY SCHMIDT. Trans. by DR. KARL WICHMANN. (Methuen, 5s.)  
*The Fourth Dimension Simply Explained.* Edited by HENRY P. MANNING. (Methuen, 7s. 6d.)

The first of these books is the outcome of a series of tutorial lectures on relativity delivered to an educated but not *specialised* audience in a town on the Elbe. It is a fuller and perhaps simpler exposition than that contained in Einstein's own book, with a wealth of analogies and much colloquial expression. It contains no mathematics. It is nevertheless not a book for everybody, but a reader with a groundwork of elementary physics and mechanics will find it useful and reliable.

The second, alas! is rather behind the times. It consists of the best essays of a popular nature on the subject

of the Fourth Dimension submitted in a competition in the *Scientific American* in the year 1909. The trouble here is twofold. The interest in the hypothetical fourth dimension, in which knots can be magically untied and left-hand gloves fitted on the right without difficulty, is not now what once it was. Since 1909 Einstein and others have helped to give us a real world of four dimensions which is unlike the old hypothetical one, and therein lies present-day interest. Secondly, many of the statements in this book are *burst up*, as they say, by the theory of relativity, and it is questionable if the publication of these essays in their original form was wise.

A. S. R.

*The Oxford Outlook.* January, March, May, and June numbers. (For the Proprietors by the Oxford Chronicle Co., Ltd., in conjunction with Basil Blackwell.)

One of the most interesting developments in post-war university life at Oxford and Cambridge has been the great increase in undergraduate journalism. In many ways *The Oxford Outlook* is the most noteworthy as it is also the most ambitious of the Oxford undergraduate publications. Started by ex-service students as far back as 1919, it is now edited by Messrs. L. P. Hartley and Basil Murray, and is published monthly during term-time. It is a literary review, which does not attempt to bow down to the lowest level of undergraduate intelligence, but sets out to publish the creative work in prose and poetry and the literary criticism of the best young minds at the university. Its contributions are, as is to be expected, somewhat uneven in value, though many of our better-known young writers have appeared in it lately, including Robert Nichols and Edmund Blunden. To those who are interested in the serious and progressive side of Oxford undergraduate life and thought, this journal is recommended.

E. L.

*Travels of a Consular Officer in North-West China.* By ERIC TEICHMAN, C.I.E., B.A. (Cambridge University Press, 25s.)

Books of travel are generally of two types, descriptive or informative. Globe-trotters and journalists usually try their hand at the informative type, government officials and resident press correspondents at the descriptive. The books of both parties, it need hardly be added, are failures in nine cases out of ten. This book is not a failure. It is written by a member of our Consular Service in China, who sets out with the definite object of conveying to the reader the information of an expert on his subject—which in this case comprises present-day conditions in the north-western Chinese provinces of Shensi and Kansu. These provinces merge, on their north-western fringes, into the vast and arid *gobi* of southern Mongolia, but, unlike their neighbouring territory, they possess great potentialities of mineral and agricultural wealth. Indeed, one of the most interesting chapters, that on railway projects, leaves one with the

impression of how great a quantity of material is waiting to be thus freed to the world.

Mr. Teichman's knowledge is based on a series of journeys that he has made through Shensi and Kansu in connection with the Anglo-Chinese Opium Treaty and other Anglo-Chinese investigations. In all he covered a distance of 4,000 miles. Particularly interesting is the account of his journey from T'Aochou to Labrang Monastery on the north-eastern borders of Tibet, and of the peculiar types of peoples, Tibetan nomads and Mahomedan and Christian missionaries, that he encountered during it.

We do not recommend this book to those who expect to read of "soaring peaks," "limitless deserts," or "valleys carpeted with flowers," but we do recommend it to serious students of geography or anthropology.

E. L.

*The Depths of the Soul.* By DR. W. STEKEL. (Kegan Paul, Trench, Trübner & Co., Ltd., 6s. 6d.) (For further details see under "Books Received.")

This book of short studies by a well-known Austrian psycho-analyst has suffered to some extent in the translation to another language. Dr. Stekel is rather apt, like many other psycho-analysts, to over-accentuate single motives as the mainsprings of our desires and actions; but he is obviously a fine writer of prose (a fact which can easily be realised despite some of the blemishes of translation), and he has here shown us the literary possibilities of his science. In this book we see him as a creative writer making use of his valuable special knowledge. As such he would have acted more wisely in dropping all technical language, but the intrusion of coldly scientific words does not, fortunately, hide the intensity of feeling and the power of revelation that Dr. Stekel undoubtedly possesses.

Our fancy was particularly taken by *Eating*, over-indulgence in which the author ascribes, with, it must be said, a rather unconscious humour, to a displacement of the sex impulse, *Those Who Stand Outside*, in which he shows the inner sadness of a physician's life; and *All-Souls*. In the last study he finely expresses the transiency of early friendships. He describes the failure of a joint expedition that he took with one who several years before had been his most devoted friend and whose friendship he had wished to renew, and he sums up the reason for the failure in these words: "Was that anything wonderful? Years had passed. Each one of us had experienced thousands of impressions, and what had once been common and had borne the same image had become so different that it would have been impossible to recognise them as having had a common origin. And thus it is that we stand on the roads that once were so near each other but now are so wide apart, and that we call to each other like frightened children seeking flowers in the woods and longing anxiously to hear the voices of their comrades. We call to each other to prove to ourselves that we have not died."

E. L.

## Books Received

(Books mentioned in this column may or may not be reviewed in this number, or in a later number.)

### HISTORY

*A Constructive Notebook of English History.* By E. H. DANCE, M.A. (Basil Blackwell, 3s. 6d.)

A useful book to schoolmasters in preparing notes for history courses, and to advanced students. It is a skeleton-outline of British history from prehistoric times to the present day, and it indicates possible subjects and lines of study, supplementing them with valuable bibliographies.

### MISCELLANEOUS

*The Heart of Nature, or the Quest for Natural Beauty.* By SIR FRANCIS YOUNGHUSBAND, K.C.S.I., K.C.I.E. (John Murray, 12s.)

*Twenty-five Years in East Africa.* By JOHN ROSCOE. (Cambridge University Press, 25s.)

### PSYCHOLOGY AND PSYCHO-ANALYSIS

*The Depths of the Soul.* Psycho-Analytical Studies. By DR. WILLIAM STEKEL. Authorised Translation by DR. A. S. TANNENBAUM. (Kegan Paul, Trench, Trübner & Co., Ltd., 6s. 6d.)

*The Gain of Personality.* A Popular Psychological Statement of the Practical Values of Personality. By W. CHARLES LOOSMORE, M.A. (John Murray, 6s.)

This book should prove welcome to those who, afraid of the subtle theories of psycho-analysis, would rather commit themselves to a more apparently obvious and practical exposition of "how to make the best of your character."

### APPLIED SCIENCE

*Fuel and Refractory Materials.* By A. HUMBOLDT SEXTON, F.I.C., F.C.S. New edition revised and enlarged by DR. W. B. DAVIDSON. (Blackie & Son, Ltd., 12s. 6d.)

*Hydro-Electric Engineering.* Vol. I: "Civil and Mechanical." Editor, DR. A. H. GIBSON; Contributors, H. D. COOK and EDITOR. (Blackie & Son, Ltd., 25s.)

*Chemical Technology and Analysis of Oils, Fats, and Waxes.* By DR. J. LEWKOWITSCH, M.A., F.I.C. Sixth edition. Edited by GEORGE H. WARBURTON. In three volumes. Vol. I, 36s. net; Vols. II and III in the press. (Macmillan & Co., Ltd., 36s. net.)

*Introduction to Textile Chemistry.* By H. HARPER, B.Sc., etc. (Macmillan & Co., Ltd., 3s. 6d.)

*A History of Aeronautics.* By E. C. VIVIAN and W. LOCKWOOD MARSH. (Collins, 30s.)

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